Review of industrial policy in Rwanda

Data review, comparative assessment, and discussion points

Ben Shepherd
Anna Twum

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EXECUTIVE SUMMARY

This report aims to inform ongoing discussions in Rwanda about the future direction of its industrial policy. The purpose of the report is not to make strong recommendations, but to present data and analysis that can inform discussions in country involving government and civil society stakeholders. The objective is to provide a thorough review of recent experience with an eye to supporting high quality discussions—and subsequently strong decisions—in relation to future direction. We contextualize Rwanda's performance by presenting comparisons whenever possible with two rapidly industrializing African countries (Ethiopia and Mauritius), and two rapidly industrializing Asian countries (China and Vietnam). The purpose of these comparisons is to stimulate discussions about what can be learned from experience elsewhere, not to suggest that a particular model can be imported wholesale into a very different context.

Rwanda has been very successful in supporting structural change -- the movement of economic resources out of agriculture into more productive sectors (industry and services). However, aggregate productivity growth, although rapid, lags fast-growing comparators such as China primarily because efforts to promote *within-sector* productivity growth have been less successful. There needs to be a renewed focus on supporting reallocations of economic resources within sectors, from low productivity firms to higher productivity firms. The overarching aim of industrial policy should be to support rapid and sustained increases in aggregate productivity, driven by a combination of structural change and within-sector productivity growth.

The global economy has changed in recent decades and is today much different than when China and Korea began their industrialization drives. Roughly half of world trade occurs in global value chains, and this "trade in tasks" is the growing segment of the world market. The new industrial development paradigm involves narrow specialization and trading in tasks in a context of complex cross-border production platforms. It no longer makes economic sense to develop full domestic supply chains, in the way South Korea did, in order to take part in competitive global industries. The value chain model of development starts with measures that enable local firms to join value chains. Over time, they need to be supported in efforts to move up to higher value added activities.

Rwanda typically lags the comparator countries in terms of its integration in goods and services Global Value Chains (GVCs). A key shift in mind-set from production for the domestic market, to production for the world market based on "importing to export", i.e. making use of the best quality and most reasonably priced inputs (goods and services alike) regardless of the location where they are produced. Productivity growth requires the realization of economies of scale, which can only come from a focus on serving the world market. But even the East African Community (EAC) is a small source of demand relative to the world market. Similarly, the world market is a source of technology rich imports of capital goods and intermediate inputs.

Key areas of government intervention to help boost productivity growth through industrial policy could include:

1. **Developing a value chain approach to industrial policy, involving key public and private sector across, and covering commercial services in addition to goods.** Rwanda's involvement in value chains is much lower than that of the comparator countries in Africa and Asia. Promoting value chain participation – at the regional and global level -- and moving up should be key policy priorities. This suggests using new data to map extant chains and fostering the most promising one by analysing impediments to growth.

2. **Supporting the development of national quality infrastructure, focused on the use of international standards and development of Mutual Recognition Agreements for testing and certification with key external markets.** Small countries, like those in ASEAN, have made extensive use of MRAs to help avoid costly re-testing procedures that keep smaller firms out of regional and international markets. More extensive use of international standards—those issued by transnational bodies, as well as those from key overseas markets such as the EU and the US— could help upgrade production to world standards, and would facilitate value chain integration.

3. **Arguing against increased protection under the EAC CET review, and supporting a reclassification of goods into CET bands based on international product classifications rather than interests of member countries.** Most imports into Rwanda are undertaken by firms that export. However, the prices of those imports are subject to tariffs, and many raw materials appear to be taxed at the rate that was intended for consumer goods, thereby directly undermining the international competitiveness of Rwandan producers.

4. **Develop a culture of risk taking by reducing the government's role as a source of private sector contracts, and reducing the cost of borrowed funds to businesses. Consideration should be given to a utility patent system, as well as innovation prizes decided in consultation with industry and experts.** While significant productivity gains can be realized in the early stages of industrialization by importing technology embodied in capital goods and intermediates, movement from middle- to high-income status requires domestic innovation capacity. Even in middle income status, firms can innovate to adapt products and processes to local and regional conditions, and to realize incremental gains relative to the existing stock of inventions.

5. **Working with lead firms to develop supplier linkages -- while avoiding mandated local content requirements that penalize final producers.** Backwards linkages depend on rapid, cost-effective, and reliable contract enforcement, so reinforcing and streamlining this part of the legal system could have major economic gains. There is also a role for government agencies in reducing information asymmetries facing large lead firms, including through facilitating supplier development programs and introductions to local suppliers.

6. **Modulating the above areas to deal with sectoral specificities on the basis of comparative advantage.** Goods sectors for initial focus include: mining; primary agriculture (fruits, nuts beverages, and spices; animal farming) and forestry; textiles and leather; processed foods (dairy products, starches, grain milling, meat products, oils and fats, liquors, processed fruits and vegetables, alcohol, and fish products); light manufacturing (plastics, jewellery, metal goods, electronics, machinery, instruments, bicycles, and wood products); and some heavy manufacturing sectors (pesticides, fertilizers, and cement). Services sectors for particular attention include: travel (tourism), other business services, insurance services, financial services, and transport.

7. **From a macroeconomic standpoint, it is important over the medium term to increase the domestic savings rate to provide a pool of resources that can support growth and**

development. Rwanda's savings rate, as the government well knows, is significantly lower to what is observed in other rapidly industrializing economies. Reducing reliance on capital flows from the world market will over time be the principal instrument to reduce the current account deficit, and only by increasing savings (public and private) can this occur. The government's on-going efforts to develop the financial sector and improve tax administration are critical pillars in this effort.

In the current global economic context, industrial policy is a complex and many-faceted undertaking. Many governments have had, at best, mixed experience with industrial policy due to an undue focus on particular sectors and firms, and an unwillingness to let market disciplines weed out persistently less productive performers. Competition, including cross-border import competition, is an important driver of "creative destruction" that increases within-sector productivity. It will be important to ensure that industrial policy does not seek to prevent the action of market mechanisms, but instead to correct failures, and reinforce the operation of market mechanisms where necessary.

Industrial policy is also a learning process. Building in feedback loops with indicators of success and failure so as to adjust industrial policy requires a rigorous monitoring and evaluation process that prompts withdrawal of support for poorly performing activities and firms – and adjustment to government programs that do not deliver the desired results. A key part of that framework needs to be a major effort to improve data availability in the areas of productivity measurement in all sectors, and measurement of bilateral trade flows in services.

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INTRODUCTION

This report is an input into the ongoing review of Rwanda's industrial policy by government officials and stakeholders. Its purpose is to concisely review key data and draw out potential policy implications, and to highlight areas for further discussion and consideration by the development community in Rwanda.

At the outset, it is important to give "industrial policy" an operational definition. Many countries have used different kinds of measures under this heading, with varying degrees of success. To our mind, in the context of a country that aims to achieve rapid and sustained growth in per capita incomes, as Rwanda does with its aim of moving to middle income status by 2025 and high income status by 2050, industrial policy must help bring about that aim. In particular, its guiding principle should be the promotion of aggregate productivity growth, which over the long run is the only reliable determinant of economic growth.

Many policies can help promote aggregate productivity growth, and we deliberately do not address all of them. Education, for instance, develops human capital, which in turn can help fuel innovation and productivity growth. But education policy has a significant lag time before its economic effects are felt—that is not to say that it is not important, but it is not generally considered to be within the realm of industrial policy, the effects of which are expected in a shorter timeframe. We therefore consider the set of measures government can take to support aggregate productivity growth in the short to medium-term, primarily focused on measures to improve the business environment and investment climate, promote the transformation of savings into productive investment, shift resources to higher productivity firms, and promote structural change in the economy.

Another sense in which the term has been used focuses on discriminatory measures that use the tax system, including trade taxes and subsidies (negative taxes), to tilt the playing field in favour of particular firms or industries. Historically, many countries have used such approaches, but with very mixed results. Part of the argument of this report is that in the context of the current global economy, these kinds of policies have less to recommend them than in the past. We therefore privilege an approach that focuses on more general policies that nonetheless have differing impacts across sectors, and are intended to shift the balance in favour of the industrial economy as a whole, away from the traditional economy.

It is important to stress at the outset that industrial policy comes with many risks. Governance in Rwanda is strong, but industrial policy poses a particular challenge. In particular, there is an issue of time inconsistency: the government may offer an incentive to an investor on condition that particular objectives are achieved over time, but the investor has no incentive to comply if it believes that the government will ultimately bail it out at the end of the incentive period. This problem has been acute in many developing countries where industrial policies have not been successful, and indeed have even been harmful. The objective of industrial policy should be to reinforce market mechanisms, not eliminate them. In other words, industrial policy should not be about the government "picking winners" but instead about creating an environment in which winners can thrive, and "losers" are rapidly removed from the marketplace. The aim is to intensify, not eliminate, the process of "creative destruction" identified decades ago by the economist Joseph Schumpeter as the driver of growth in a market economy.

In reviewing Rwanda's industrial policy, it is understandably tempting for policymakers and stakeholders to take a very micro approach, concentrating on individual measures, such as tax incentives for foreign investors. While such issues are important, we believe they need to be considered against the broader sweep of development policy. This report therefore takes a holistic and wide-ranging view, but with a

focus on all times on boosting aggregate productivity. We believe that a successful industrial policy is one that moves consistently towards that end, learning more over time about the costs and benefits associated with various micro-level measures.

Box 1: Elements of Rwanda's 2011 Industrial Policy

Rwanda's 2011 policy was formulated to support Rwanda's goal of achieving middle-income status by 2010 partly through deliberate structural transformation and export promotion. At the time, agriculture formed the largest economic sector followed by a low productivity services sector. As of 2010, industry only contributed to 15% GDP primarily from construction and agro-food processing. Rwanda's trade deficit remained a concern despite increases in the flow of tourist revenue, foreign direct investment and remittances. The main risk to Rwanda's trade deficit position was it over-reliance on imports for manufacturing inputs, and higher value-add products whiles mainly exporting commodities with volatile world market prices.

As a first step, the Government of Rwanda had already implemented a series of initiatives to improve Rwanda's business environment. In 2008, the Rwanda Development Board was established to support exporters and investors interested in setting up operation in Rwanda. On the policy side the SME Development policy, Trade policy and Competition policy were finalised in 2010 to provide ministries with strategic guidance to increase exports through a vibrant private sector.

With a detailed understanding of the economic constraints and recent policy developments, the 2011 industrial policy focused on three primary objectives:
1. Create an enabling environment for Rwanda's industrialisation
2. Increase domestic production for local consumption
3. Improve Rwanda's export competitiveness

Specifically, the policy aimed to reach a target $1.5 billion of exports, more than a twofold increase from 2010 values, and create 1.4 million non-agriculture jobs by 2020. To achieve a more favourable environment for industry, the GOR set ambitious targets for reducing energy costs to regional competitive levels. Improving human capital was also a focus with particular emphasis on increasing the relevance and enrolment of vocational training schools, increasing STEM education and improving firm-level management quality. Inadequate finance was identified as a key constraint for firms looking to scale up and produce for export. In the 2011 policy, the Bank of Rwanda was given the mandate to design innovative financial products using international best practice to support SMEs and exporters. Further on the trade side, the policy addressed non-trade barriers and laid out strategies for Rwanda to take advantage of the regional markets-primarily the EAC and COMESA.

The policy also identified economic activities that drew on Rwanda's existing comparative advantages whiles presenting opportunities for enhanced backward linkages as well as the highest potential for economic and social returns.

Short Term	Medium term	long term
Agro processing	Construction	Building materials
ICT	Pharmaceuticals	Bio plastics
High end tourism	Chemical products	Other high-tech
Textiles		
Mineral processing		

Reference: MINICOM, Industrial Policy, 2011

Against this background, the report proceeds as follows. Section 2 briefly reviews recent experience with structural transformation and productivity growth in Rwanda. It also introduces a comparative perspective, focusing on rapidly growing economies in Africa (Ethiopia and Mauritius) and Asia (China and Vietnam). Section 3 situates industrial policy within the broader context of development policy, and focuses on the role played by world market linkages in promoting rapid growth elsewhere. It introduces trade data for Rwanda and the comparators, and compares when possible the degree of involvement in Global Value Chains (GVCs), based on a new development model that privileges strong patterns of specialization combined with "trading in tasks". Section 4 then moves to a consideration of various policy areas, moving from general principles to sector specificities.

The purpose of this discussion is to ensure that policymakers have the right questions and data in front of them so that they can have an informed discussion, and subsequently make the best possible choices from the perspective of Rwanda's medium-term development. Section 4 also briefly considers the macroeconomics of industrial policy, and aggregate productivity growth more broadly, in a context where the government has competing important demands on its resources, including social policies like health and education. Finally, Section 5 concludes and crystallizes the paper's discussion questions.

1. STRUCTURAL TRANSFORMATION IN RWANDA: FROM EXPERIENCE TO AMBITION

Based on historical experience, episodes of rapid growth and development essentially have two components: movement of economic resources (workers and capital) from less-productive to more-productive firms in the same sector (within sector productivity growth), and movement of economic resources from less productive to more productive sectors (structural change). This section looks at Rwanda's performance in these two areas in comparative perspective.

For the comparison, we have chosen two rapidly industrializing African economies, Ethiopia and Mauritius. In a general sense, their economies and policy settings are quite different: Mauritius has tended to favour open trade and investment policies, while Ethiopia has seen greater state involvement, on the model of countries like China. We also extend the comparison to two countries outside Africa that have seen exceptionally rapid growth and development over recent years, as well as the most rapid rates of poverty reduction ever recorded: China and Vietnam. The comparator countries represent a mix of economic sizes and development levels, but all represent potential stages in Rwanda's growth path over coming decades. While Rwanda has undoubtedly performed very well in recent years, it is important to put that performance in context, so that the need for enhancements driven by policy and private sector development can be emphasized.

1.1 Aggregate Productivity

From an economy-wide standpoint, the most important measure of productivity is total factor productivity (TFP). It is the proportion of economic growth not explained by increases in capital and labor inputs, and represents an overall measure of the level of technology in an economy. For economies at low income levels, it is possible to grow rapidly by importing foreign technology embedded in intermediate inputs and capital goods, but to make the transition from middle- to high-income status, a country needs to generate TFP growth endogenously, i.e. through domestic innovation. In the long run, after a country catches up to the global productivity frontier, TFP growth is the only source of sustainable growth.

TFP is difficult to estimate because of it is not directly observed, but instead has to be inferred from other data. The most commonly used source for economy wide TFP is the Penn World Tables (Feenstra et al., 2015). The dataset contains information for Rwanda, as well as for Mauritius and China, but not for the other countries. Figure 1 presents the data visually, from 2000 to 2014, the latest year for which data are available. All country measures are relative to the USA, which is indexed as 1.0.

The first point to emerge clearly is that Rwanda's overall technology level, as proxied by TFP, is far below that of China or Mauritius. While TFP in Mauritius is steady at a high level relative to the USA, China's level of technology is consistently increasing over time. The gap between Rwanda and China is clearly widening over time, from 0.15 points in 2000 to 0.25 points in 2014. The gap with Mauritius is closing, from 0.70 points in 2000 to 0.49 points in 2015, but that is primarily because productivity growth in Mauritius has noticeably slowed in recent years. Rwanda's TFP relative to the USA peaked in 2011 at 0.19, and since then has declined slightly to 0.18. Although a highly aggregate figure, this trend is cause for concern: productivity growth is the touchstone of rapid economic growth, so a drop off needs to be corrected as a matter of high priority.

Figure 1: Total factor productivity in Rwanda and comparators, 2000-2014
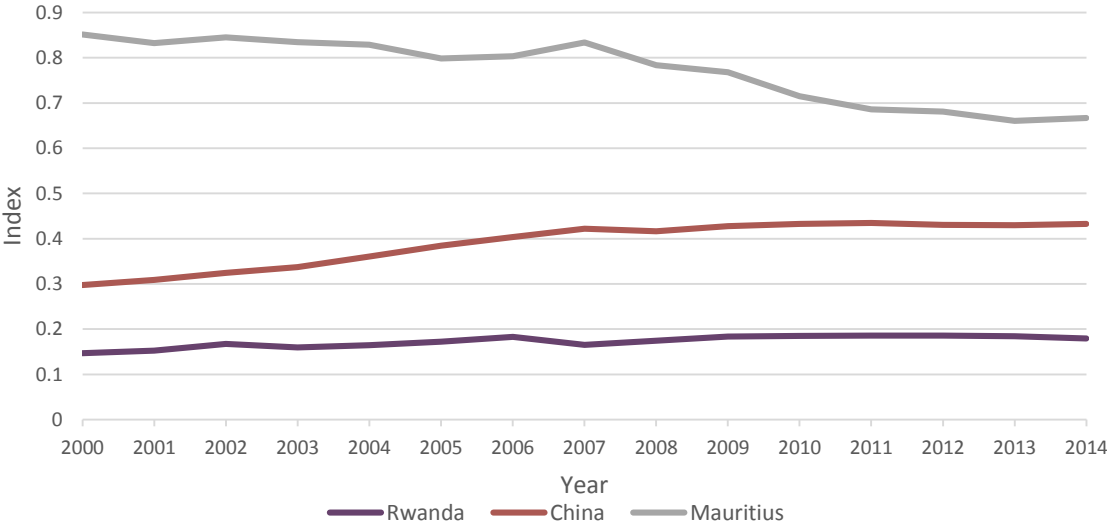
Source: Penn World Tables (Feenstra et al., 2015).

Another measure of economy wide productivity is value added per worker (labour productivity). These data are more widely available, but do not directly measure technology in a general sense. Labour productivity can increase because firms invest in capital goods that allow them to produce more output for a given level of employment, for example. Nonetheless, a review of these data can provide additional detail relative to the TFP analysis above.

Figure 2 shows aggregate labour productivity (value added per worker) for Rwanda and the comparator countries. The first point is that, as in the case of TFP, the level of labour productivity in Rwanda is far below what is observed in Mauritius or China. It is substantially higher than is the case in Ethiopia, but below Vietnam. To put the numbers in perspective, as of 2016 aggregate labour productivity in Rwanda was 36% higher than in Ethiopia, but 93% lower than in Mauritius, 89% lower than in China, and 46% lower than in Vietnam. The labour productivity figures confirm the existence of a very large productivity gap between Rwanda and other rapidly growing developing countries, with the exception of Ethiopia.

Figure 2: Value added per worker in Rwanda and comparators, 2000-2017, constant USD
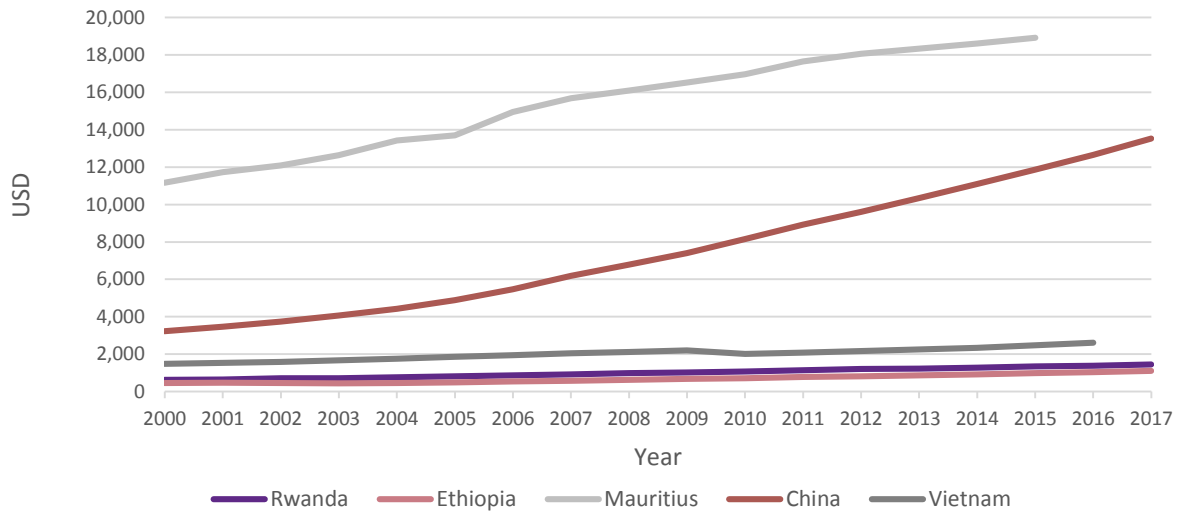
Source: Authors' calculations based on data from World Development Indicators.

Figure 3 presents the same data as Figure 2, but rebased so that all countries start at an index number of 100 in the year 2000. Changes over time can then be interpreted in percentage terms. The figure clearly shows that China has enjoyed sustained aggregate labour productivity growth at a steady rate over the entire sample period. Rwanda has also enjoyed increasing labour productivity every year for the last decade and a half, but at an annual rate that is only around one half of that in China. The result is the divergent lines in the figure, which reflect the effect of compounding over the medium-term. Over recent years, performance in Rwanda and Ethiopia has been quite similar, whereas growth rates in Mauritius and Vietnam have been slower.

Figure 3: Growth in value added per worker in Rwanda and comparators, 2000-2017, index (2000 = 100)
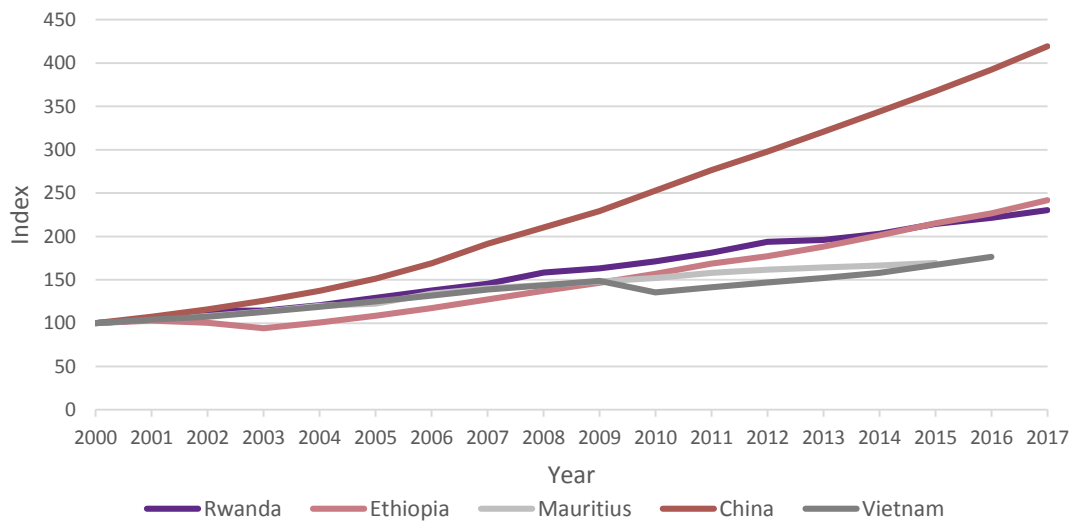
Source: Authors' calculations based on data from World Development Indicators.

The key takeaway from this review of aggregate productivity data is that Rwanda remains at a level that is significantly below that of the comparator countries with the exception of Ethiopia. The comparison in levels is stark. In growth rates, it is more nuanced, as Rwanda has outperformed Vietnam and Mauritius, but has not seen the rapid and sustained productivity growth of China. Of even greater concern is that the rate of productivity growth in Rwanda peaked in 2010 (10.3%), and has fallen consistently since then, with just a slight rebound to 6.9% in 2017. Despite this slowdown, on an annualized basis, productivity growth in Rwanda averaged an impressive 5.0% over the 17 years, but for China the comparable figure was 8.8%. This difference in growth rates compounds over time, and leads to major differences in outcomes: in 2017, Rwanda's aggregate labour productivity was 2.3 times higher than in 2000, but for China the multiple was 4.2 times. To support the vision of sustained and rapid growth in per capita incomes, Rwanda clearly needs to accelerate the growth of productivity.

1.2 Decomposing Productivity Growth: Within-Sector and Structural Change.

Following McMillan et al. (2014), we can decompose productivity growth into two components.[1] The first component is within-sector productivity growth. The second is productivity growth stemming from reallocation of labour to more efficient sectors. The second component therefore provides a convenient summary of the extent to which structural change has tended to boost productivity over time.

Figure 4 shows results for Rwanda and the African comparators. The analysis is conducted repeatedly over five year timeframes. Sectors considered are agriculture, industry, and services. We do not pursue a more disaggregate analysis because of lack of data. In the case of Rwanda, the strong overall productivity growth referred to above, and reflected again in the total height of each bar in Figure 4, is driven to a declining extent over time by within-sector productivity gains; indeed, the within-sector effect is in fact negative for 2010-2015, which is consistent with the slowdown noticed in the TFP data above. In Rwanda, the bulk of the improvement observed in aggregate labour productivity has in fact stemmed from reallocations of workers to more productive sectors, i.e. industry and services. The position for the other two African countries in quite different. While Ethiopia saw the main share of productivity growth due to structural change in 2000-2005, that position changed dramatically for 2005-2010 and 2010-2015, as within sector productivity growth has come to dominate. In Mauritius, within sector productivity growth dominated in all periods.

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[1] Mathematically, the decomposition is: $\Delta Y_t = \sum_{i=1}^{N} \theta_{i,t-k}\Delta y_{i,t} + \sum_{i=1}^{N} y_{i,t} \Delta \theta_{i,t}$ where Y refers to aggregate labor productivity, y refers to sectoral labor productivity, N is the number of sectors (indexed by i), and θ is the share of employment by sector.

Figure 4: Breakdown of labour productivity growth, 2000-2015, Rwanda and African comparators

Rwanda

Ethiopia

Mauritius

Figure 5 shows results for the Asian comparators. The two countries display quite different patterns of growth. In China, within sector productivity growth is strongly dominant in all periods, with structural change largely absent in 2010-2015. A declining role for structural change is to be expected, given the amount of structural change that has already taken place in China. In Vietnam, by contrast, structural change plays a more important role, although within-sector productivity growth dominates in the 2010-2015 period.

Figure 5: Breakdown of labour productivity growth, 2000-2015, Asian comparators
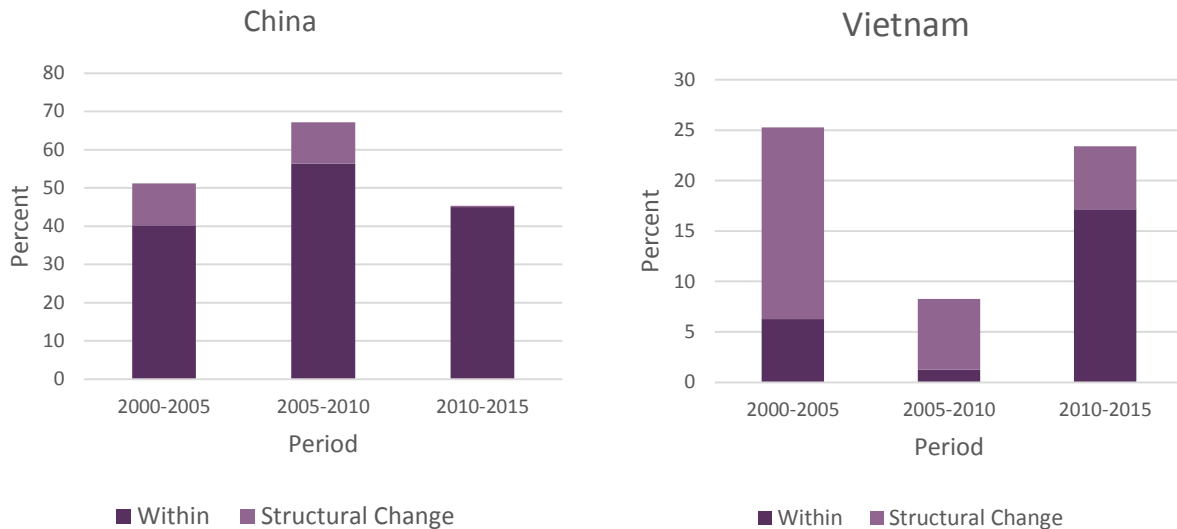
China

Vietnam

The conclusion to draw from this decomposition of the data is that Rwanda has been very successful in promoting structural change over recent years. That process has moved at least as fast as in the comparators, and in some cases considerably faster. However, within-sector productivity growth has lagged. The primary reason why Rwanda lags behind faster growing economies like China is that productivity growth within sectors is slower. A priority for industrial policy therefore needs to be to ensure that high productivity firms can grow, which tends to lift sectoral productivity. The flipside of this dynamic is that low productivity firms need to be able to exit the market, so that their resources (capital and workers) can move to higher productivity firms, thus facilitating their expansion.

The mechanism is well set out in the trade literature following Melitz (2003). Empirical work has shown that lowering trade costs, whether through cutting tariffs or reducing other types of policies that negatively affect imports, is one very effective way of increasing sectoral productivity through this mechanism (e.g., Pavcnik, 2002 for the case of Chile). Miroudot et al. (2012) show that the mechanism applies equally well to services as to merchandise trade.

To see the issue with within-sector productivity growth more clearly, Figure 6 shows value added per worker in industry and services, using constant US dollars. Industry labour productivity peaked in 2004 and declined fairly steadily over the next decade, followed by a slow recovery since 2015. The upwards trend in labour productivity in services was more sustained through 2012, but then there was a sharp fall in 2013 and 2014, followed by a slower recovery in later years. Figure 6 highlights the primary difficulty that Rwanda's industrial policy should be aimed at addressing: the need to support sustained and rapid increases in productivity in industry and commercial services.

Figure 6: Value added per worker in industry and services, Rwanda, 2000-2017, constant USD
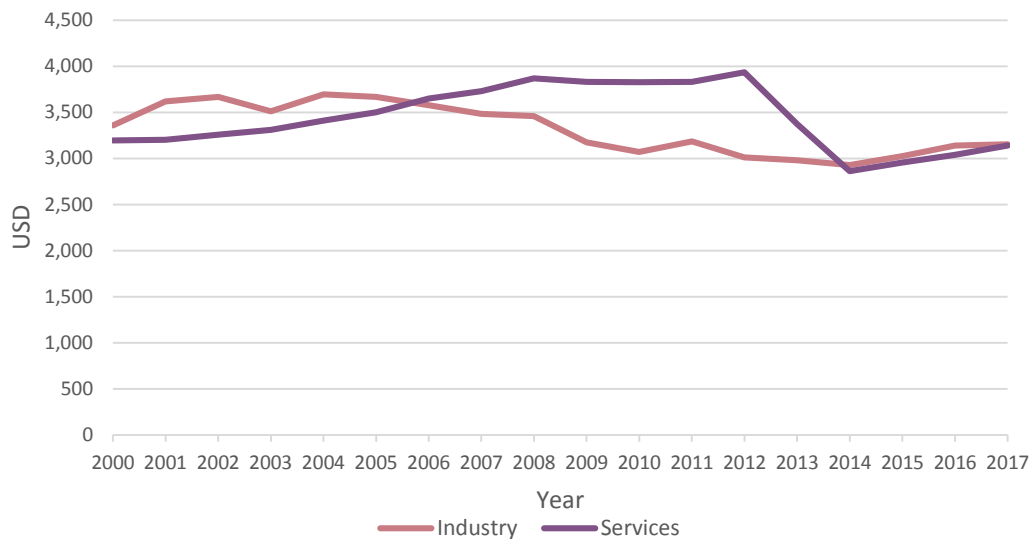
Source: World Development Indicators.

In interpreting this analysis, it is important to recall that the "industry" aggregate includes activities that are typically considered as services (construction), as well as mining, and manufacturing. Due to lack of data availability on non-manufacturing industry as a share of GDP, we cannot perform the decomposition in a more disaggregated way. However, an important fact to note is that Rwanda's share of manufacturing in GDP has generally been falling over time: in 2000 it was 7.3%, whereas in 2017 it was only 5.9%. We know that agriculture has equally been falling as a percentage of GDP, so the implication is that the resources released from manufacturing and agriculture are going into mining and construction. This is an important, and troubling, dynamic: the manufacturing sector is not the unique motor of development, but it is more susceptible to the development of complex backward and forward linkages than mining, for example. Addressing impediments to the growth of manufacturing, as opposed to other parts of industry, will be a key issue for policymakers going forward.

2   INDUSTRIAL POLICY AND DEVELOPMENT STRATEGY IN THE CONTEXT OF GLOBAL AND REGIONAL VALUE CHAINS

How have economies like China sustained high rates of within-sector productivity growth, at the same time as supporting structural transformation? An important part of the answer relates to international trade. Productivity growth is driven not only by technological change, but also by the realization of scale economies. Even a large, but still middle income, market like China's is not large enough to support maximum reliance on scale economies in key manufacturing sectors. The experience of rapidly developing countries in recent decades has therefore uniformly been to rely on world markets as a source of demand, which can drive scale economies, but also as a source of technology embodied in imports of capital goods and intermediates.

Figure 7 brings this point home by looking at the trade to GDP ratio in Rwanda and the comparator countries. Larger countries tend to have smaller trade to GDP ratios, as their residual internal markets are larger. Notwithstanding this, Rwanda, a small country, has a trade to GDP ratio similar to much larger countries like China and Ethiopia. Mauritius and Vietnam (itself considerably larger than Rwanda) have

much higher trade to GDP ratios, in excess of 100% in both cases. The suggestion in these data is that more recent industrialization efforts have focused relatively more heavily on world markets, for the reasons outlined above.

A key conceptual framework in economies currently undergoing rapid industrialization is the value chain development model. Building on Baldwin's (2011) analysis, the value chain approach of countries like Vietnam and Mauritius differs from the whole supply chain approach of the previous wave of industrialization, typified by South Korea, through a focus on linking to geographically dispersed networks of production that operate on trading in narrowly defined tasks, rather than development of full domestic supply chains. A rapidly industrializing country can now join a GVC by specializing in one activity in which it has a comparative advantage, and rely on other countries to undertake other tasks based on their own comparative advantages. For instance, Vietnam has very successfully joined the electronics value chain without developing the full range of component manufacturing, design, and research and development functions. Those functions are conducted elsewhere, while Vietnam leverages its abundant labour to undertake assembly tasks.

Such an approach both reflects the reality of the modern world economy, where value chains account for around 50% of world trade according to WTO (2015) and also offers a potential advantage for small countries: narrow patterns of specialization do not require large support bases, and enable countries to leverage comparative advantage at a very micro-level. Over time, the objective is to "move up" the value chain to activities with larger spillovers and growth potential, particularly knowledge intensive services. Criscuolo and Timmis (2017) discuss the various ways in which participation in GVCs can promote productivity growth, which we have suggested should be the touchstone of Rwanda's industrial policy.

Figure 7: Trade to GDP ratio, Rwanda and comparators, 2000-2015, percent
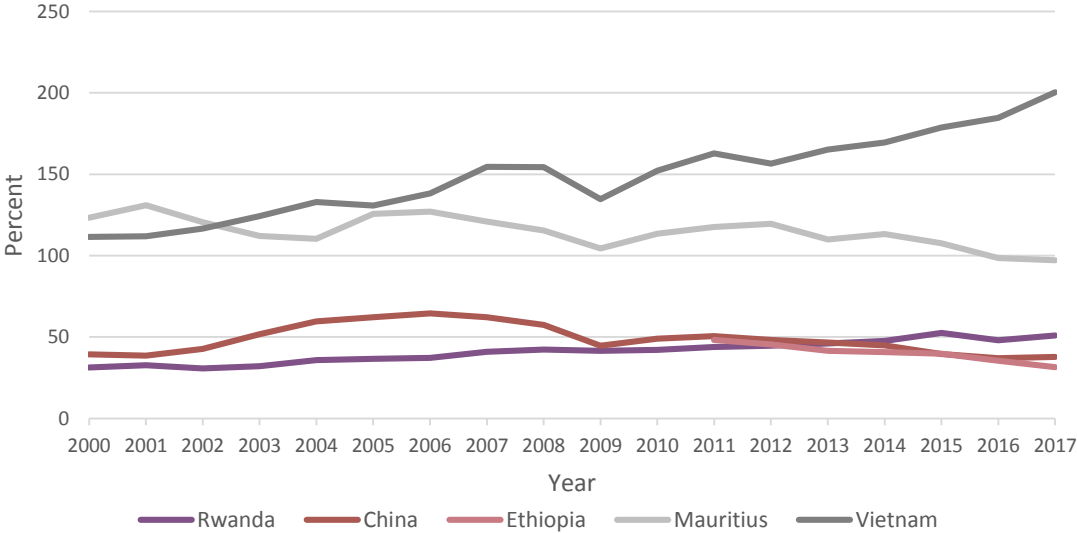
Source: World Development Indicators. Note: Trade to GDP ratio can be above 100% because GDP is measured in value added terms (net of intermediate inputs) while trade is measured in gross shipments terms.

The trade to GDP ratio is a very simple statistic summarizing a country's level of engagement with the world economy. Trade is clearly important to the Rwandan economy, but it does not yet play the same role as in comparators like Mauritius and Vietnam. A likely explanation is that those countries are more heavily integrated into global and regional value chains (GVCs) than Rwanda is. To investigate whether

this is in fact the case, we examine data on trade in value added. Koopman et al. (2014) show that input-output tables can be combined with trade data to produce estimates of trade that net out intermediate input use, and which are thus fully compatible with national accounts. An advantage of this approach is that it makes it possible to identify domestic and foreign origin value added in a country's gross exports. Foreign origin value added reflects the use of imported intermediate goods and services in producing a country's exports, and a higher percentage relative to gross exports is generally considered to be consistent with a greater degree of integration into GVCs (Johnson and Noguera, 2012).

An important initial point to stress is that in the context of GVCs, the objective for governments is not to maximize the proportion of domestic value added in gross exports. This idea may seem counterintuitive. But empirical evidence shows that domestic and foreign value added tend to be complements rather than substitutes. In other words, domestic value added in dollar terms tends to grow more quickly in the presence of foreign value added. To see this, Figure 8 shows data on the transport equipment sector in Thailand. The example is chosen because GVCs, led by Japanese multinationals, are known to be very active in this sector in Thailand, with major production plants supplying regional markets. The left hand panel shows that between 1995 and 2011, domestic value added as a share of the total actually fell slightly. But the right hand panel makes clear that this fall facilitated spectacular growth of the industry, as it multiplied in total size many times over. From an economic perspective, the growth shown in the right hand panel translated into increased exports, increased tax receipts, and—most importantly—increased employment. As an aside, we would argue that such explosive export growth must be based on rapid advances in productivity, which is the key driver of competitiveness in world markets.

Figure 8: Domestic and foreign value added in Thailand's transport equipment exports, shares (left) and values (right), 1995 and 2011
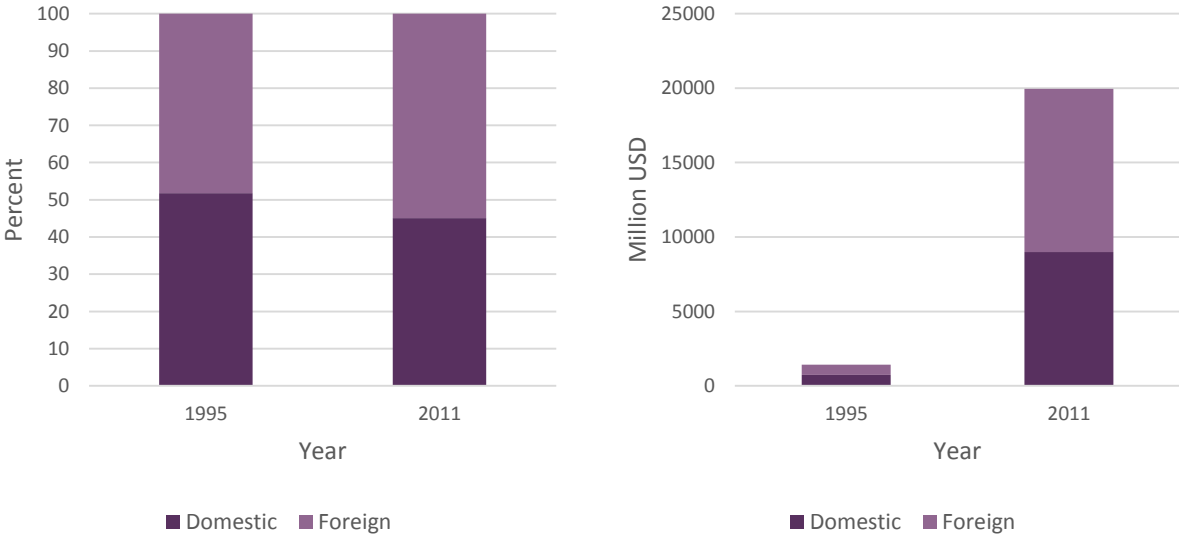
Source: Shepherd (2017a), based on data from the OECD-WTO Trade in Value Added (TiVA) Database.

Figure 9 uses World Bank data to show the proportion of foreign value added in gross exports of clothing for Rwanda and the comparator countries. Looking at the database from a global perspective, we can see that the rise of GVCs is reflected in a higher proportion of foreign value added as a percentage of gross exports in 17 out of 27 sectors between 2001 and 2011.

Only three years of data are available for the analysis, but the picture is quite consistent: Rwanda has the lowest proportion of foreign value added in this sector of any of the countries in the sample. What does this mean from a competitiveness standpoint? Clearly, for clothing manufacturers to be globally competitive, they need access to high quality intermediate inputs, such as textiles, at reasonable prices. The world market is the obvious source for those inputs: there is no particular reason to believe that the world's highest quality and best priced textiles are sourced from Rwanda itself, or even from East Africa. Rather, firms need to be free to purchase inputs from wherever in the world is best at producing them. The Vietnamese clothing industry is a stark example of this process: the local industry is specialized in final operations on clothing, and imports vast quantities of fabrics and other inputs from competitive global suppliers. As a result, Vietnam has seen its clothing exports increase by 165% in seven years, compared with 49% in Rwanda. To be clear, 49% growth over this time period is very positive. But the industry's growth rate in Vietnam has been explosive at around 7.4% per annum, which means that employment gains—and likely also the productivity gains—have been correspondingly large.

Figure 9: Foreign value added share of clothing exports, Rwanda and comparators, 2004-2011, percent
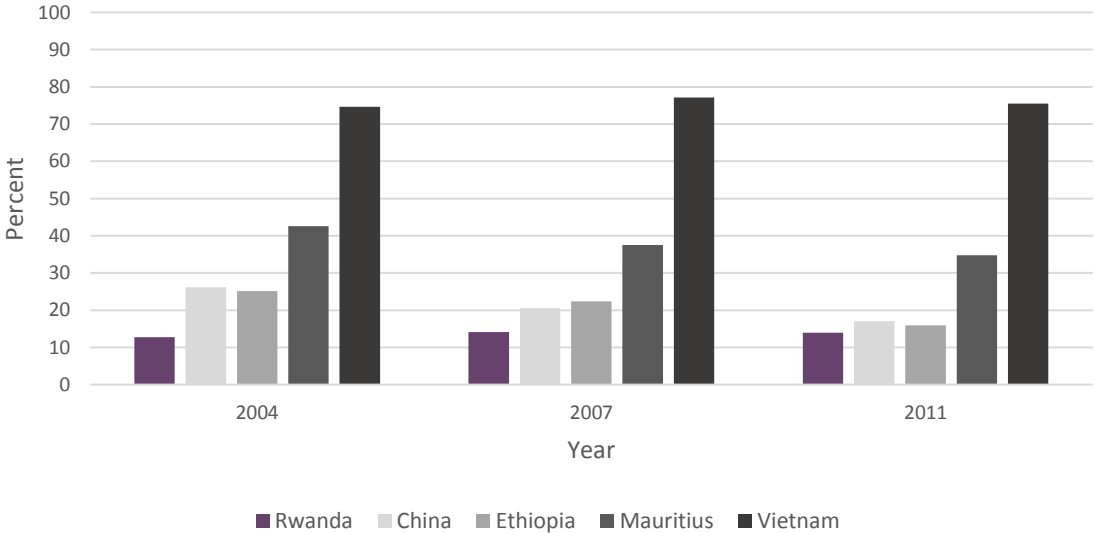
Source: World Bank Export Value Added Database (EVAD) and Labour Content of Exports Database (LACEX).

Figure 10 repeats the exercise for processed foods. The finding is identical. With the exception of 2007, when China's foreign value added share was slightly lower, Rwanda is otherwise consistently the country with the lowest proportion of foreign value added in exports in this sector. The proportion is only about one quarter the level observed in Vietnam, for example. In this case, Rwanda has experienced a boom in this sector from a low base—with growth of over 200% over seven years—but Vietnam, which had 2004 exports that were 400 times Rwanda's, still grew at a rate of 190%, which is explosive for a more mature industry. Although more nuanced than in the case of clothing, this results nonetheless again shows the importance of linking to GVCs for rapid industrial growth on the basis of competitiveness in world markets.

Figure 10: Foreign value added share of processed food exports, Rwanda and comparators, 2004-2011, percent.
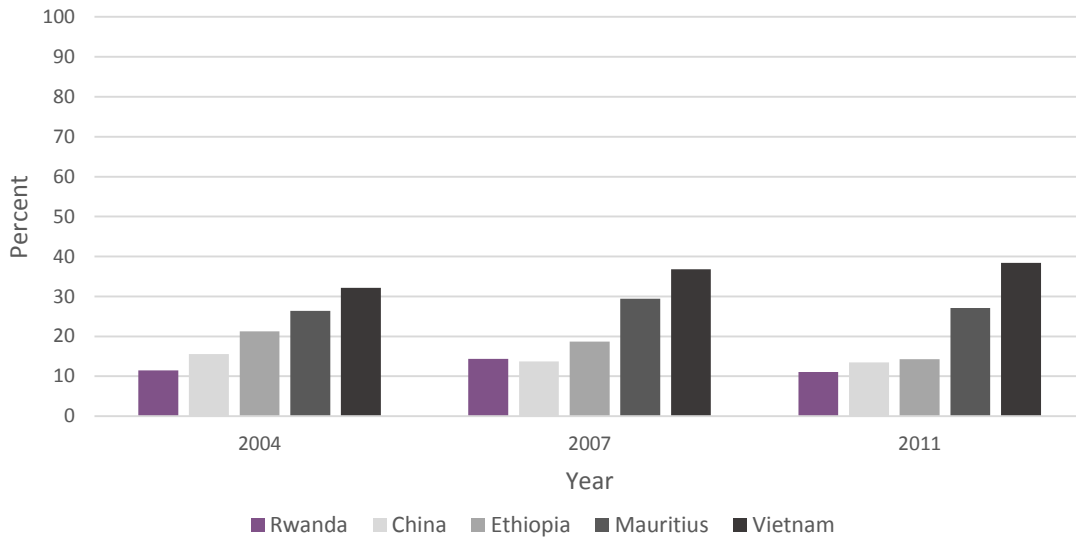
Figure 11 paints a more nuanced picture for the machinery sector, which includes electronics. In this sector, Mauritius has the lowest proportion of foreign value added, followed by Rwanda. Again, Vietnam stands out as having a particularly high proportion of foreign value added, around 3.5 times what is observed in Rwanda. In terms of export growth, Rwanda saw rapid growth of 118% between 2004 and 2011, but in Vietnam export growth was 566% over the same period. It is important to recall that Vietnam started from a much higher baseline—in 2004 its exports were nearly 1,000 times larger than Rwanda's—so the subsequent explosive growth is even more striking.

Figure 11: Foreign value added share of machinery exports, Rwanda and comparators, 2004-2011, percent.

GVCs are not only active in goods sectors, where they first arose. They are also active in services, so the same analysis can easily be applied to key services sectors. Figure 11 shows the case of financial services. The share of foreign value added is generally lower in this sector, likely due to a combination of sectoral characteristics and regulatory measures that have the effect of impeding trade. However, in comparative perspective, Rwanda again has the lowest proportion of foreign value added in exports of any of the countries under consideration. Mauritius, an important financial center, has a proportion of foreign value added that is 5.5 times higher than Rwanda's, while Vietnam has a proportion that is 8.2 times higher. Taking Mauritius as a benchmark for sectoral export growth, it has seen growth of 67% over the seven year period for which data are available. Rwanda's growth rate is much higher, at 193%, but it started from a much lower baseline: in 2004, exports of financial services were about 100 times higher in Mauritius than in Rwanda.

Figure 12: Foreign value added share of financial services exports, Rwanda and comparators, 2004-2011, percent.
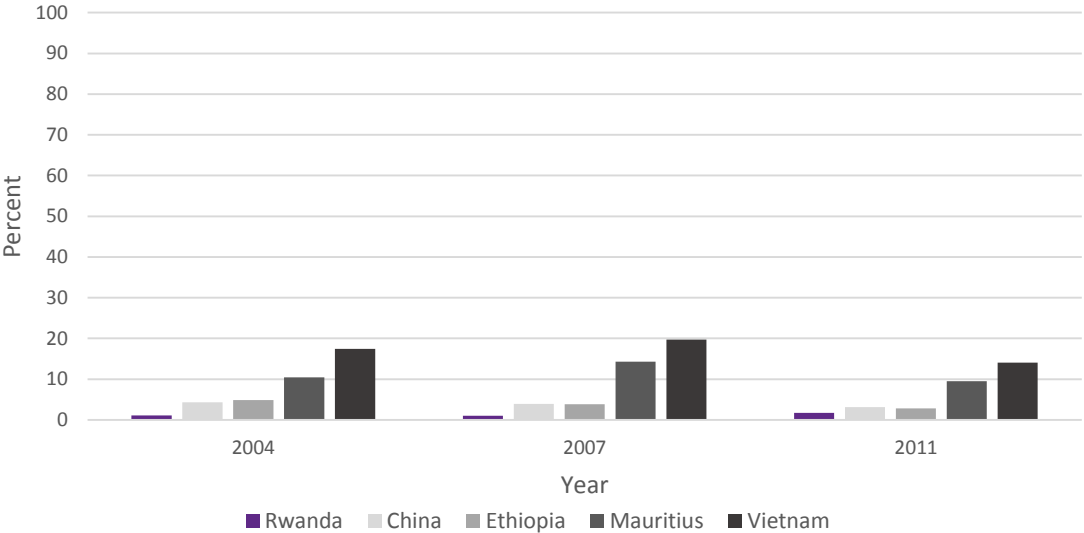
Source: World Bank EVAD and LACEX databases.

The above analysis has focused on only a few sectors, covering services as well as goods, but the findings are clear. Rwanda is almost uniformly less involved in GVCs than the comparator countries, even though it may be relatively more involved than many other economies in Sub-Saharan Africa. But the relevant comparison given Rwanda's intended future growth path is with the most successful economies regionally and globally, not with those that are experiencing more significant problems. The differences through this lens are often stark, with Vietnam—arguably the most recent and successful industrializer among the group—standing out as giving a broad scope to the use of foreign value added to grow exports in way that is typical of the GVC development paradigm discussed above. In most cases, the limitation of Rwanda's strategy of more limited use of foreign value added is that export growth, and by implication total sectoral growth and also productivity growth, are slower than what is observed elsewhere. There are exceptions, however, but only in sectors where Rwanda was starting from a very low baseline, and so achieving explosive growth is relatively easier than in a more mature sector. The lesson from the comparator countries is that if Rwanda is to scale up its most competitive industries through a value chain development model, it will need to take steps to increase the role played by intermediate inputs—services as well as goods—sourced from world markets.

3   EMERGING POLICY ISSUES AND CHALLENGES

Before moving to a consideration of key policy challenges Rwanda faces as it reviews its industrial policy, it is helpful to summarize the key findings from Sections 2 and 3:

1. Rwanda has been undergoing rapid structural transformation, which is very positive in terms of supporting long run income growth.
2. However, within-sector productivity growth has stalled or even reversed over the last few years.
3. As a result, the focus for a revised industrial policy should be on boosting productivity growth, which in turn will translate into higher exports because more productive firms are better able to overcome trade costs and break into world markets..
4. In the current global economic context, the relevant unit of analysis is the value chain. Rwanda does not need to develop entire domestic supply chains in the way Korea did, but instead can focus more narrowly on niche tasks and "moving up" the way current rapid industrializers like Vietnam have.
5. In manufacturing, Rwanda appears to be significantly less integrated in GVCs than comparator countries, because it engages to a more limited extent in "importing for exporting", i.e. the use of imported intermediate goods and services.
6. The same position holds in services, which is also an area of active value chain development.

With these points in mind, the following subsections discuss eleven key policy issues the government will need to consider in reviewing its industrial policy. The list is by no means exhaustive, and is designed primarily as a starting point for discussion in-country. As noted at the outset, we do not make strong recommendations, except in cases where we believe there is very clear evidence in one direction. Rather, we focus on motivating a discussion of policy issues with relevant data and research, so that the government has the best available information with which to discuss options and ultimately make decisions.

3.1 Global Value Chain Strategy

Recent experience with industrialization both in Africa and elsewhere, particularly in East and Southeast Asia, has privileged an approach grounded in GVCs. Vietnam is the key example here, but the model is also strongly in evidence in China and Mauritius, and is emerging in Ethiopia although significant barriers remain in that case. Although there is inevitably a regional dimension to the development of competitive value chains, the outlook is fundamentally global. In the early stages, most value chains are driven by lead firms from high income countries that bring together complex networks of suppliers in low and middle income countries. Specialization takes place according to comparative advantage, with countries typically joining value chains in relatively low value added activities like assembly in goods markets or customer support (call centre) operations in services. But over time, as labour markets tighten and costs increase, continued participation is only viable if the fundamentals are in place for "moving up" to higher value added activities, such as input production, and especially upstream services like research and development, as well as downstream ones like marketing.

From the point of view of policymakers, but also commercially, it makes sense to envisage an outward-oriented development strategy through the lens of value chains as the unit of analysis. This perspective makes it possible to focus on activities and relationships at the micro-level, such as niche specialization and trading in tasks, but also encourages paying detailed attention to the question of linkages among firms performing different tasks within the chain, whether those linkages are domestic or cross-border. In terms of developing Rwanda's industrial fabric, the value chain perspective offers the potential of a more holistic approach to developing a competitive base for trade integration and market development,

and is also in line with the latest development thinking in rapidly industrializing economies elsewhere, particularly in East and Southeast Asia.

Rwanda is of course in a different position from economies in East and Southeast Asia, in the sense that it is further from large, high income markets (there is no equivalent of Japan as a nearby "anchor economy"), and it suffers from being landlocked as opposed to having direct maritime access. On the one hand, this analysis means that regional cooperation, which plays a role in all GVCs, may be even more relevant for Rwanda. But Rwanda should not lose site of the objective of being competitive in world markets. Although it may not attract large scale assembly activity in the way China has, the experience of a country like Mauritius, only one tenth of Rwanda's population and similarly isolated from high income markets, albeit with maritime access, should be informative. Mauritius has been able to integrate into GVCs in sectors like apparel, including through relationships with globally competitive lead firms like H&M.

A key point that needs to be stressed is that GVCs are not only active in goods markets. That is certainly where they developed, in sectors like apparel, consumer electronics, and motor vehicles. But there are also emerging value chains in services sectors, based on the offshoring of functions previously typically performed within the borders of the firm. Services GVCs range from relatively low value added activities like call centres and certain back office or support operations, to high value added activities like research and development, engineering, design, and marketing and branding. Of course, most goods value chains have a heavy services element as well, particularly in higher value added segments. As a result, in the current economic context, industrial development through GVC integration involves working with goods sectors and services activities in a holistic way. Services can be important value chains in their own right, but they can also help move goods value chains from low- to high-value added activities. For instance, development of design services helps a goods value chain like apparel or leather move into niche segments where margins are higher than in mass market segments. Similarly, development of computer services potentially adds value to many other value chains by helping goods producers leverage technology to better reach and serve distant customers, as well as to optimize production processes by using the techniques of the Fourth Industrial Revolution. From a policy perspective, there is therefore a strong case for Rwanda to focus on GVCs as the relevant unit of analysis for its industrial policy, but to ensure that goods and services are both given attention within that general context.

Given that GVCs are driven to a large extent by the decisions of large lead firms, typically multinationals, a key question that arises is the role government should play in terms of facilitating investments by those firms in the local economy. Many countries have experience with applying direct incentives for this kind of FDI, and Rwanda is no exception. However, recent analysis suggests that the pattern of incentives is complex, constitutes a drain on government revenue with foregone revenue amounting to perhaps 5%-6% of the total, and is rarely effective in the sense of targeting marginal firms (those whose decision is really affected by the incentive) and leading to durable investments and realization of promised undertakings by investors (Steenbergen and Von Uexkull, 2018).

Box 2: Evidence on Rwanda's FDI Incentives
Tax incentives have been an important part of Rwanda's strategy to attract new investors into the country and stimulate its priority sectors. In 2015, Rwanda updated its 2015 investment code and expanded incentives through a set of generous tax holidays and corporate income tax (CIT) rate reductions. Under the new law if an international company headquartered in Rwanda meets the minimum level of capital investments and job creation it would be eligible for a 0% corporate tax rate, while any registered investor would be eligible for a 15% corporate tax rate if they invest in a key economic sector- energy, mass transportation or telecommunications. Companies that plan to invest at

least fifty million United States Dollars and contribute a minimum of thirty per cent of this investment in the form of equity in energy, export-oriented sectors, health and ICT. The Investment Code also includes stipulations for the equal treatment of both foreign and national investors across all investor rights and protections.

An important consideration is the effect of the new investment code on investment. The policy aims to increase investments across the board but with a focus on some key sectors which include manufacturing. Steenbergen and Uexhell 2018, use a microsimulation of firms to estimate the effects of Rwanda's current tax incentive structure. Their findings are as follows:

- No effect: 14% of tax expenditure go to firms without significantly affecting their ROE (46% of firms). This may occur when many firms only benefit a small amount, but does little to improve profitability and so also would not affect their investment decisions.

- Unviable investments: 21% of tax expenditure (7% of firms) benefits those whose returns are very low even with incentives. These investments are not viable with or without incentives, and thus incentives are unlikely to generate new investment.

- Redundant incentives: 55% of tax expenditure (44% of firms) go to investors with high returns on investment, even without incentives. While there may be investors requiring very high returns to start investing, it is generally less likely that such incentives had any effect on investment. Rather, it likely represents a windfall to firms that would have invested anyway.

- Marginal firms: Only 11% of tax expenditure goes to firms whose investment decision is more likely to have been affected by incentives, which amounts to only 3% of firms. These firms shifted from generally unprofitable to profitable as a result of receiving tax incentives.

To move towards a more effective tax incentive program, Steenbergen and Uexhell encourage the GOR to make sure that an investor contributes to export promotion, job creation or backward linkages before offering incentive packages. Such an approach would reduce the number of incentives that have no effect on the economy at the end of the day. They also advocate for a shift from profit-based incentives to cost-based incentives that reward companies for investing in their business and the Rwandan economy. Cost based incentives can take the form of accelerated tax depreciation, investment credits or additional tax allowances. Steenbergen and Uexhell recommend a tax credit system. Other recommendations are:

- Incentives should be strategically targeted toward efficiency-seeking FDI, investors that need them and to priority areas in manufacturing and export more broadly. Eligibility requirements for tax incentives lock out smaller firms that might benefit more from support compared to much larger firms that have the balance sheet to take more business risks whiles remaining competitive. Currently, wholesale/ retail trade disproportionately benefit from tax incentives that should be reserved for the manufacturing sector. Customs duty exemptions should better align with Rwanda's priority sectors by exempting productive inputs and excluding consumer goods.

- Ensure suitable take-up of incentives through transparent and rule-bound administration: Provide greater clarity to investors around all of Rwanda's tax incentives and expected contracts from RDB. Tax incentives programs should be evaluated yearly to ensure that they are aligned with Rwanda's economic priorities.

Reference: Steenbergen, V., and E. Von Uexkull. 2018

While there is certainly a role for the use of direct incentives, policymakers should consider streamlining the system and making it more predictable, in keeping with Rwanda's strong record on governance and stability. Indeed, empirical evidence suggests that direct incentives for FDI are typically most effective in countries where there are significant governance issues, which is not the case in Rwanda (see Harding and Javorcik, 2011).

Experience in Asia suggests that GVCs can be very durable even through severe shocks, despite the fact that capital is highly mobile. The key consideration is whether or not a lead firm has made a relationship-specific investment. If it has, then it has a strong commercial incentive to maintain a durable presence, and work with local partners in a dynamic way as conditions change, and activities evolve. For instance, these kinds of investments by electronics lead firms in Thailand meant that after severe flooding that damaged a significant proportion of the world's hard drive manufacturing capacity in 2011, exports were able to recover within six to 12 months because the lead firms had the incentive to rebuild, rather than move to a neighboring country (Shepherd and Cattaneo, 2014). Direct incentives from the government carry the risk of having a shorter term, less durable effect. And of course from a dynamic point of view, considerable discipline is necessary to avoid the situation where an investor makes increasingly costly demands of the government even as performance may disappoint.

A key question for policymakers is whether or not incentives should discriminate in favor of foreign, versus domestic, investors. Indeed, Steenbergen and Von Uexkull (2018) argue that from a performance standpoint, Rwanda's tax incentives appear to have had a stronger impact on domestic investment as opposed to FDI. Of course, investments in improving productive capacity and developing value chains should be encouraged whether they are domestic or foreign in origin. Many countries, Rwanda included, allow a tax credit for R&D, for example, that is available to foreign and local businesses alike. Similarly there may be scope for using accelerated depreciation or first year write-offs of equipment purchases to incentivize businesses, regardless of where their capital is held, to develop productive capacity. As part of the review of Rwanda's industrial policy, it will be important to look at the tax system in full, as it applies to local investors and foreign investors, to see whether incentives can be streamlined, focusing on learning from experience with measures that have already borne fruit elsewhere. Given competing demands on government revenue (see further below) it will also be important to ensure that incentives are as targeted and effective as possible, so that fiscal drain can be limited moving forward.

3.2 Business Environment and Investment Climate

Improving the business environment, focusing on the ease of doing business, has been a key objective for Rwanda over recent years. It is now ranked second in Africa, after Mauritius, on the overall Ease of Doing Business indicators compiled by the World Bank. There are a number of important areas where Rwanda performs very strongly. For instance, it is a strong performer in terms of procedures for starting a business—but this area is in any event less of a constraint for a large foreign investor with access to resources and skilled professional advice, than it is for a small domestic firm. Similarly, Rwanda is ranked second in the world for registering property, a very important point for all types of commercial activity, whether involving local or foreign investor. It also has a very high rank in terms of getting credit, sixth globally, but this reflects the fact that the necessary regulatory infrastructure is in place; it does not consider the price of credit (interest rates), which we address below.

By contrast, Rwanda ranks 112th in the world in terms of dealing with construction permits, an area where procedures could be streamlined and time and cost reduced. The electricity supply is a well-known constraint on industrial development in Rwanda, and generation and transmission capacity will need to be sharply upgraded as part of an overall approach to industrial policy. Currently, Rwanda ranks 119th

globally on the electricity indicator in Doing Business, primarily due to the length of time required to obtain a connection and its corresponding cost. Efforts are afoot to implement an industrial tariff for electricity that may help this situation, but ultimately rapid industrial development will put strain on the power grid, which will need to be upgraded accordingly.

Trading across borders is also a constraint, with Rwanda ranking 87th. The time and cost associated with border compliance are relatively high, and have not come down significantly in recent years. We address trade facilitation below, in the context of trade policy. But as a landlocked country, Rwanda has a particular interest in ensuring that its border procedures are as efficient as possible, with the aim of reducing the time, cost, and uncertainty associated with cross-border movements of goods.

Another area that may need attention is the time and cost of enforcing contracts, where Rwanda currently ranks 85th globally. This point is an important one for supplier development and backward linkage programs, discussed below. From the perspective of value chains, contracts are a vital way in which lead firms and suppliers interact to develop innovative ways of dividing up production processes and adding value. As such, streamlining contract enforcement is one key way in which foreign lead firms can be incentivized to enter into supplier agreements with local firms, including SMEs.

Simplifying the business environment, in particular in ways that help support the implantation of value chains in goods and services, is an important element of industrial policy. Rwanda can build upon its important successes in this area to further improve the institutional environment and make it more conducive to long term relationships among firms based to a significant extent on cross-border transactions.

3.3 National Quality Infrastructure

Quality plays an important role in two main respects in a value chain model of development. First, producers can only join a value chain if their goods satisfy the standards used by the lead firm, which typically regulate quality and fitness for purpose, as well as interoperability with other components in important sectors like consumer electronics. Figure 13 shows an analysis of firm-level survey data on uptake of internationally recognized quality certifications in Rwanda and the comparator countries. Although Rwanda performs well relative to Ethiopia and Mauritius, its firms' use of international quality certifications is less than in Vietnam, and less than one-third the rate observed in China. This point is important because GVCs typically use international standards: they are serving the global market from a dispersed network of production facilities, so national standards tend to be of little interest, at least for mass market goods where a high degree of standardization and quality assurance is required. This behaviour is as true of traditional light manufacturing (e.g., size and colour fastness in apparel production) as in newer sectors like consumer electronics (e.g., safety and interoperability of components). As such, developing national quality infrastructure in a way that enhances Rwanda's prospects of increasing its level of participation in GVCs is crucial. And it applies equally to services and to goods.

Figure 13: Percentage of manufacturing firms with an internationally recognized quality certification, Rwanda and comparators, latest available year.
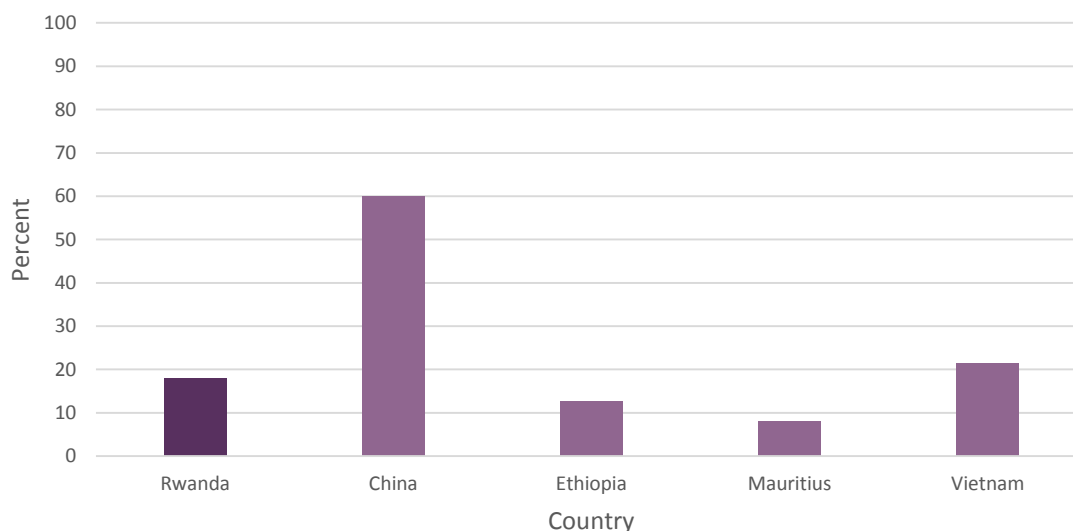
The second way in which quality is important is that it provides a way for a country to move up the value chain to higher value added activities. GVCs are built around niche production opportunities through task-based specialization and intense cross-border trade. As human capital and organizational skills develop, firms can move into more sophisticated—and higher quality—niches. The view was expressed by some government officials in interviews that Rwanda ultimately sees itself as a niche, high quality producer, in the way that a country like Switzerland is globally recognized in certain highly specific activities. Developing this kind of quality in fact and in appearance (reputation) is a long process involving many components, but an important part in the GVC context is the development of national quality infrastructure in a way that stresses conformance with international standards, whether issued by transnational bodies like ISO, or applied in major developed markets like the EU (DIN, AFNOR, and CEN standards, for example).

Singapore is an interesting case study of the development of national quality infrastructure in an open way that facilitates GVC integration. Enterprise Singapore, the national standards body, privileges the use of international standards, both those from transnational organizations and those from major target markets. National standards are typically only used in cases where there is no applicable international standard, or where very particular circumstances demand it. As such, production in Singapore—a small economy—is focused on complying with standards used by target markets, and firms can easily link to global producers in goods and services sectors alike.

Of course, national quality infrastructure is not only about issuing or recognizing standards. (Shepherd, 2014 provides a policy-oriented discussion of the various aspects of standardization that intersect with trade and development.) It also covers other areas like metrology, testing, and certification. The costs of developing this infrastructure in one step can be prohibitive for small economies. ASEAN—which with the exception of Indonesia is made up of small economies—has dealt with this problem by emphasizing mutual recognition agreements (MRAs) for conformity assessment (i.e., testing and certification). Multiplicity of testing and certification requirements increases costs for producers, and can inhibit trade.

MRAs streamline this process by allowing one country to recognize test results produced elsewhere, and have been shown to be trade facilitating (Baller, 2007).

Developing the necessary capacity and moving forward on MRAs for conformity assessment with key markets should be a priority for Rwanda. Technical assistance will likely be necessary, but global and regional standards bodies, as well as international organizations like the International Trade Center and UNIDO, have the development of these kinds of capacities as core business. To use resources most efficiently, it would make sense to focus quality efforts initially on a relatively small set of sectors where Rwanda has comparative advantage, whether in goods or services (see further below); this has been the approach in ASEAN, for example. Rwanda has made some strides in this area. The Rwanda Standards Board (RSB) has obtained certification in different international standards, most notably in ISO 9001. The RSB is constantly working towards adding new product standards and re-certifying products. Inspection and testing facilities are available to firms who would otherwise need to send test samples abroad for analysis. The RSB also provides training to quality management companies involved in hazard analysis and general standards monitoring. With the recent Made in Rwanda policy, the RSB is gearing up to build an even stronger quality infrastructure fit for Rwanda's ambitions to compete on global markets.

Developing a global reputation for high quality is a long process, and one that typically takes efforts well through upper middle income status. But moving forward in an open way—making maximum use of international standards and liming national standards to what is strictly necessary, combined with conclusion of MRAs on conformity assessment—can help position firms to take advantage of the commercial opportunities offered by GVCs.

3.4 Trade Policy in Goods

As a small economy, Rwanda cannot feasibly use its domestic market to support the development of economies of scale required for sustained productivity upgrading in the industrial sector. There is no recent example of an economy of 12 million people successfully developing primarily through reliance on its domestic market. The experience of other small economies has been radically different. Examples are Singapore (population 5.6 million), Hong Kong (population 7.3 million), Mauritius (1.3 million), and even Taiwan (population 24 million). All countries in this list except for Mauritius are already fully industrialized and have attained high income status; Mauritius is in the upper middle-income category. Attempts to leverage domestic demand to support industrialization in small economies are an understandable first step historically, but import substitution rapidly showed its limits in all cases. All of these economies have looked further afield to support rapid industrialization: they have fully embraced outward orientation, in the sense that they have used the world market, through exports and imports, to support rapid productivity growth and industrialization. In this sense, even Rwanda's regional market is small: in 2016, the EAC countries combined accounted for 0.2% of world GDP, and a similar proportion of world imports. In other words, Rwanda's regional market is also small relative to the world market. In the current industrial environment, where GVCs are constructed by a relatively small number of lead firms looking for maximum efficiency, the reality is that only a vision anchored in the world market can support rapid industrial development, productivity upgrading, and income growth.

In particular in the GVC context, the import side of trade policy is just as important from an industrial development standpoint as the export side. Indeed, the firms that export the most also tend to import the most (Spray and Steenbergen, 2018). Even though some high income country policymakers are increasingly seeing trade in terms of "winning" (exports) and "losing" (imports), nothing could be further from the truth in economic terms. Two mechanisms are of particular importance. The first is the link

between import sourcing and export competitiveness. From a value chain perspective, what matters is the competitiveness of niche producers targeting large external markets. If those producers are forced—either through an explicit local content requirement or through trade policy that increases the price of imported intermediates—to use local inputs when they would rather, for sound commercial reasons, use foreign ones, then their competitiveness is undermined, and their ability to access large overseas markets is diminished. Altering the commercially sound decisions of firms in terms of import sourcing in effect acts to hold back their process of productivity upgrading. While there may be benefits for local input suppliers, the net effect on aggregate productivity—which should be the touchstone of industrial policy—may in fact be negative.

A second mechanism is that from a macroeconomic standpoint, exports and imports are largely complementary. Economists almost uniformly believe that the current account, of which the balance of trade is a significant part, is determined largely by macroeconomic factors, specifically the balance between savings and investment. Rwanda has a significant current account deficit, but this is the unavoidable counterpart of an investment rate that is significantly in excess of public and private savings. Somewhat counterintuitively, trade policy plays only a very limited, and mostly short term, role in adjusting the balance of trade: a tariff increase, for example, can in the very short term decrease demand for imports, but that in turn leads to an appreciation of the exchange rate that tends to reduce exports and re-establish the previous balance. Versions of this mechanism have been widely accepted by economists since the 18th Century, but many countries at all income levels experience difficulty in translating this logic into concrete policies. We say more on the drivers of the current account below, in particular Rwanda's low savings rate; but the problem is a macroeconomic one, and will not ultimately solved by any programs designed to increase exports or decrease imports.

Rwanda's membership of the EAC comes with costs and benefits in terms of its trade relations. The main benefit is preferential access to the regional market, although this needs to be seen in the context of the size of that market relative to the world market. The cost is that Rwanda had to accept the EAC Common External Tariff (CET) when it joined in 2009. The CET's structure was intended to be simple, with three tariff bands: 0% for raw materials and capital equipment; 10% for intermediate goods; and 25% for final goods. There are a number of issues in practice, however. One is that Sensitive Items lists have been used to impose substantially higher rates of protection on selected commodities. A second, highlighted by Frazer (2014), is the misclassification of some intermediate goods and even raw materials as final products, thus driving the dynamic discussed above whereby an enforced shift to domestic input suppliers undermines producers' competitiveness. Admittedly, classification of goods based on end use is not straightforward, as a significant number of goods are dual use: for instance, consumers buy car tires directly for final use (consumption good), but tires are also an intermediate input into the production of a motor vehicles as a final good. This input switching dynamic is surely one reason why producer associations in some countries are calling for increased protection, perhaps through a fourth tariff band, during the ongoing CET review.

To give a sense of how these issues play out for Rwanda in the context of the CET, Figure 16 presents MFN tariffs—which should reflect the CET in Rwanda's case—for four broad categories of goods defined by UNCTAD, which should similarly reflect the relevant bands in the CET. However, except for consumer goods and intermediates, rates of protection are substantially higher than would be suggested by the CET's structure, which suggests that there has been substantial misclassification of goods. For instance, the average tariff on capital goods is 4%, when it should be zero, while for raw materials the average rate is 13% when it should again be zero. Moreover, these averages hide substantial variation at the tariff line level: the maximum tariff line rate for capital goods is 35%, while it is 60% for raw materials. From a

competitiveness standpoint, it is likely that the CET is imposing substantial constraints on Rwandan producers: imports of raw materials and intermediate goods are taxed at substantially higher rates than in all of the comparators except Ethiopia.

Figure 14: Simple average tariff rates by end use, Rwanda and comparator countries, 2015, percent ad valorem.
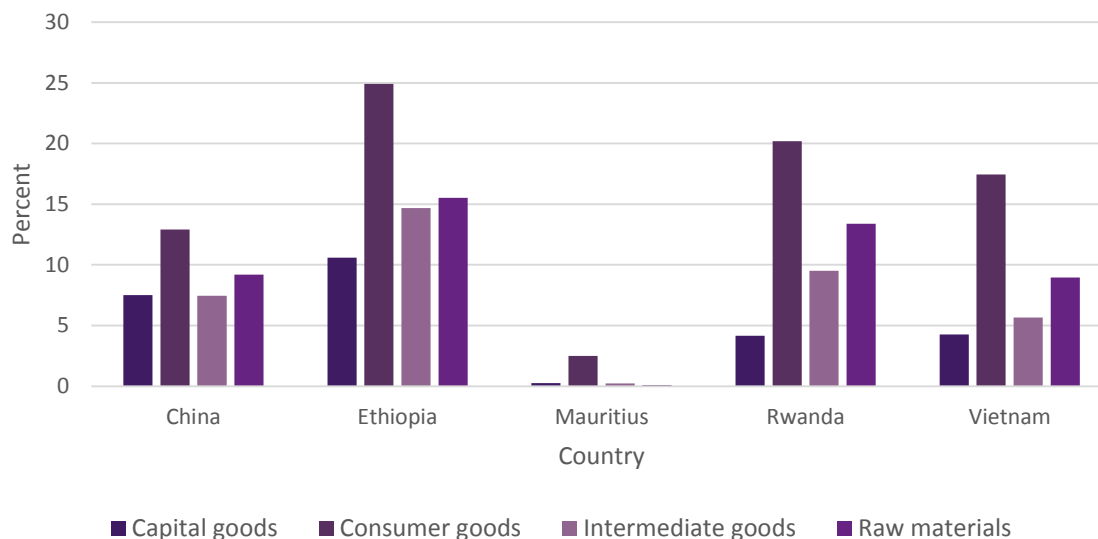
Source: TRAINS data accessed via WITS.

Box 3: Examining the Impact of the Common External Tariff of the East African Community in Rwanda
In 2005, the Common External Tariff was created under the EAC to encourage the manufacturing of higher value-added products by increasing the market cost of non-EAC goods. Since its inception, the CET has had a three-band structure for determining tariffs on imports to EAC member countries: 0% for raw materials, 10% for semi-finished products and 25% for finished goods. In exceptional cases, some items are classified as a sensitive item and can incur a tariff of between 35-100%.
Rwanda joined the EAC in 2007 and adopted the CET in 2009. At that point, the CET was almost fully negotiated, and Rwanda had to move away from its 0-5-15-30 tariff structure: 0% on raw materials, 5% for economically essential goods, 15% for semi-finished goods and 30% for finished products). Despite this, the EAC still offered Rwanda a larger market through trade ties with Tanzania, reduced tariffs and opportunities for more FDI.

A significant challenge to implementing the CET is the problem of misclassification of goods that should, for example, enjoy 0%-10% tariff because they are inputs into manufacturing but end up under the 25% tariff band and effectively stifle production. IGC research finds that nearly 200 product lines primarily imported for manufacturing came into Rwanda under at least a 25% tariff. This is not in line with the broad goal of the CET and its tariff band structure. At least 600 other product lines could be eligible for re-classification to accurately reflect the final use of the products. IGC developed a customizable tool to help the GOR evaluate critical product lines for its manufacturing sector. The tool would be essential for Rwanda when the time comes for renegotiation of the CET.

The problem of misclassification could be mitigated if firms took advantage of duty remission schemes that allow firms to apply for tariff exemption for inputs. However, the relatively large gap between the CET tariff rate and the effective rate in the manufacturing sector indicates that firms do not always take

advantage of these exemptions. Some firms might find too costly to go through the exemptions process and in some cases might be unaware of what exemptions they can apply for. It is critical for GOR to investigate these potential causes and develop interventions to address any information asymmetries or financial constraints for smaller firms.

The Sensitive Items (SI) list is another challenge under the CET. The list is meant to afford exceptional protection to firms within strategic and protected sectors, however, with tariffs between 35-100%, firms have no incentives to increase productivity and compete on global markets. It also has disproportionate welfare effects on the poor that rely on staple food items for daily sustenance.

Lastly, IGC finds that even under the CET, landlocked countries are disadvantaged because of the cost of transport which increases the final cost of goods. IGC recommends that landlocked countries should enjoy lower CET rates that equalize the cost of imported goods across the EAC. eg. Tanzania enjoys lower transport costs and should pay a higher CET than Rwanda which has higher transport costs.

Reference: Frazer, Garth. 2014

Figure 17 shows that the structure of tariffs, in combination with other factors, influences Rwanda's pattern of imports; it uses the same UNCTAD product classification as in Figure 16. Rapid industrialization tends to be associated with significant imports of raw materials (for use in processing), intermediate goods (for value addition), and capital goods (to upgrade production practices and boost productivity). Vietnam and China typify this approach. It is significant that even a huge consumer market like China in fact imports mostly products in those three categories. In Rwanda, imports of intermediate goods are broadly comparable as a proportion of the total, but imports of capital goods and raw materials are much lower. These are exactly the categories where the CET—likely due to misclassification—imposes significantly higher duties than originally planned under the three tier scheme.

Figure 15: Breakdown of imports by end use, Rwanda and comparators, 2016, percent.
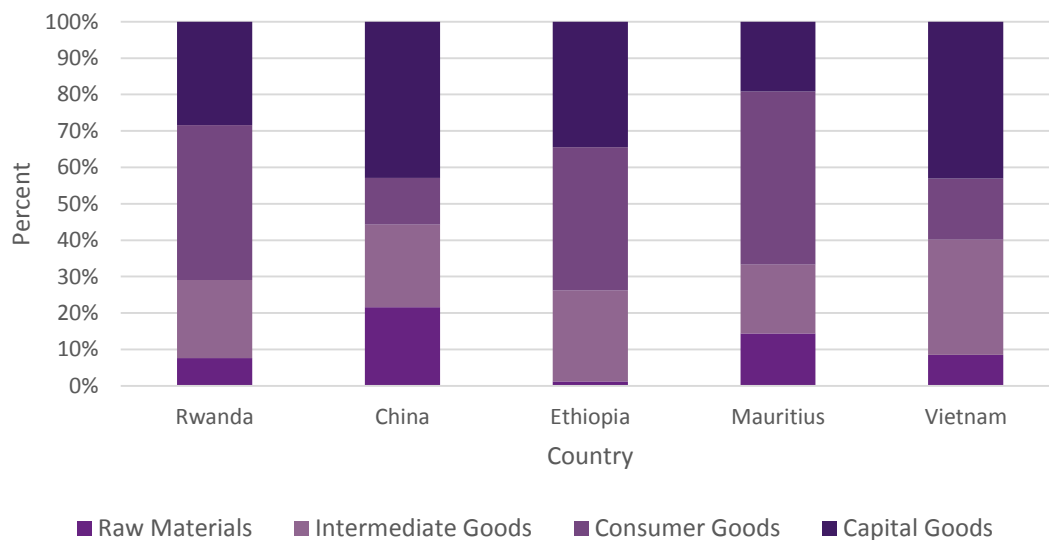
Source: UN Comtrade data accessed via WITS.

As the region-wide review of the CET progresses, Rwanda has a strong interest in opposing additional tariff protection, as sought by some industries in other countries, and above all in rationalizing the CET so

that raw materials and particularly capital goods indeed enter the country completely duty free. Tariff negotiations are always subject to political economy problems, both at the level of countries and at the level of industries. It seems likely that the CET's product classification is in part due to lobbying by businesses seeking protection by having their outputs classified as one type of product, when in fact international experience suggests they are a different type. In addition, the availability of the Sensitive Items list makes it possible for industries to seek much higher levels of protection: Frazer (2014) shows that many raw materials and intermediate inputs are in fact on the sensitive items list.

One simple argument Rwanda should make is that an international classification, such as the UNCTAD one we have used here, should be applied to reclassify goods in the CET and apply tariff protection accordingly. Classifications decided at a technical level in international institutions are relatively free from political economy considerations, and thus are more likely to reflect genuine economic and commercial considerations. Another argument would be to remove the Sensitive Items list entirely and rely solely on the economic classification of goods, as originally intended. However, larger countries in the EAC do not necessarily perceive their interests in the same way, so it will be challenging to ensure that this position prevails in the CET review.

A more promising avenue from a political point of view is to concentrate on areas of trade policy not directly governed by the CET. Trade facilitation is one example. Rwanda has been ambitious in planning for implementation of nearly 85% of the WTO Trade Facilitation Agreement's (TFA) provisions by 2020, without additional capacity building support. However, the TFA is only a starting point for moving forward on trade facilitation, for two reasons. First, the global best practice frontier is far ahead of the TFA's provisions in areas like use of information technology and interoperability of systems across countries. Second, the TFA's focus is narrowly on customs and border procedures, whereas successful trade facilitation in the era of GVCs requires a more holistic approach to reducing the time, cost, and uncertainty associated with cross-border movements of goods (Shepherd, 2016).

Trade costs in a comprehensive sense include all factors that drive a wedge between the factory gate price in the exporting country and the consumer price in the importing country. As such, trade costs are much larger than tariff rates of protection: for instance, Anderson and Van Wincoop (2004) survey a large literature to estimate that a representative high income country may face trade costs of the order of 170%, made up of international trade costs of 74% and local distribution costs of 55%, all expressed in ad valorem equivalents. These figures compare with a typical rate of tariff protection of less than 5%.

Arvis et al. (2016) show that trade costs tend to be even higher in lower income countries. Figure 18 uses an updated version of their dataset to show average trade costs across all partners in manufacturing for Rwanda and the comparator countries. In part due to its landlocked status, Rwanda has the highest trade costs in the group, at around 2.5 times the level observed in China. Mauritius is an interesting point of comparison: as a relatively isolated island country, it should also exhibit relatively high trade costs, but in fact Rwanda's trade costs are around 1.5 times higher than those in Mauritius. Although trade costs have trended downwards in Rwanda over recent years, that follows a period of upwards movement that is in sharp distinction to the strong downwards trends in Vietnam and China.

Figure 16: Trade costs in Rwanda and comparator countries, manufactured goods, ad valorem equivalent 2000-2015.
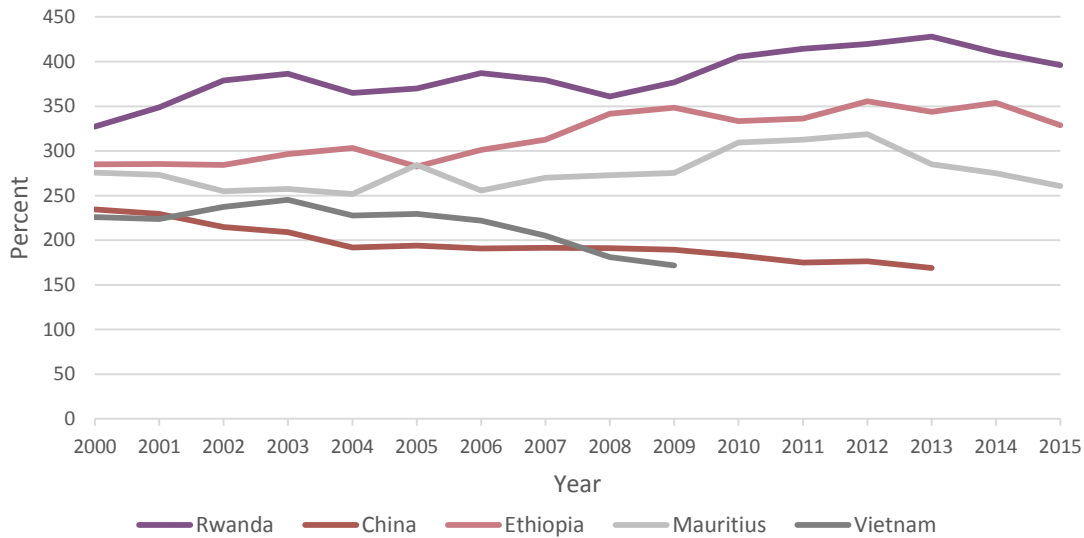
Rapid industrialization through trade is necessarily more difficult in landlocked countries due to the higher trade costs imposed by geography. But it is not impossible. European examples like Switzerland show that a broad approach to trade facilitation—efficient border procedures, exceptional infrastructure, and high quality private transport and logistics services—can help overcome part of the disadvantage of being landlocked. Closer to home, the example of Mauritius similarly shows that disadvantageous geography is not an insurmountable barrier to rapid outward-oriented growth. The Mauritian example is also important because unlike Switzerland, it does not have high income neighbours (notably Germany, in the case of Switzerland). To a large extent, Mauritius has leveraged trade with the EU to drive its outward oriented growth strategy: in 2017, the EU accounted for just over 50% of the total goods exports of Mauritius. By contrast, in 2017 the EU was Rwanda's fifth largest export destination, at just under 8% of the total. In fact, Rwanda exported more by value to neighbouring DRC than it did to all 28 EU countries. This comparison brings out very starkly the difference in focus and strategy between the two countries: a regional approach versus a global approach.

Figure 19 shows average trade costs in manufacturing with EU countries for Rwanda and Mauritius respectively. The figure is rebased so that both countries are indexed to 100 in 2000; subsequent changes can then be interpreted in percentage terms. Rwanda starts from a higher baseline, with trade costs with the EU about 20% higher than is the case for Mauritius. Of more concern, though, is the trend: whereas Mauritius reduced its trade costs with the EU by about 20% over 15 years, Rwanda's trade costs with the EU in fact increased by a similar proportion over that timeframe.

Figure 17: Trade costs in Rwanda and Mauritius vis-à-vis the EU, manufactured goods, index (2000 = 100), 2000-2015.
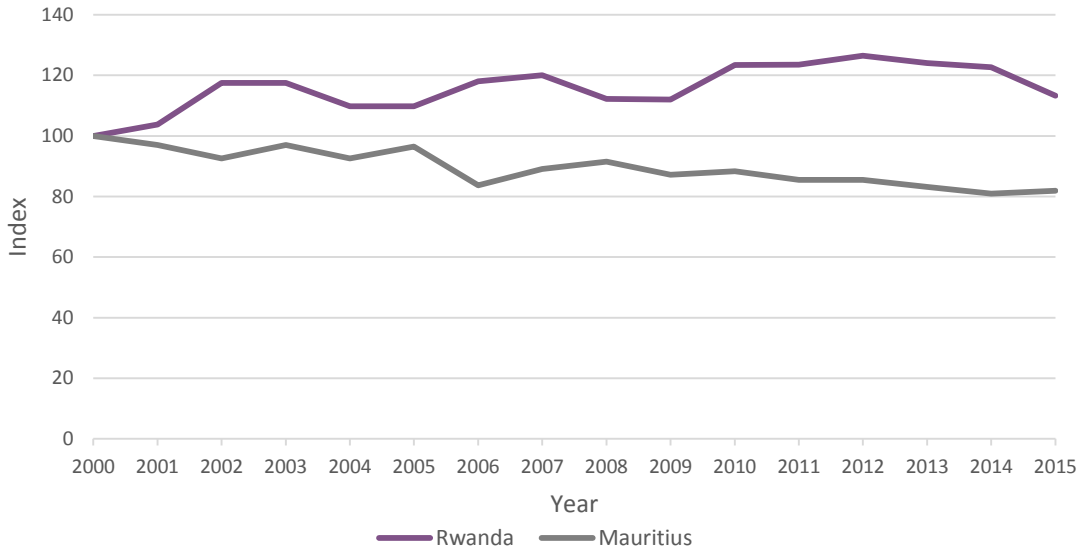
Source: UNESCAP-World Bank Trade Costs Dataset.

As this example suggests, a key part of Rwanda's trade strategy moving forward should be to integrate further with large, high income markets. Recent development experience in regions like Southeast Asia highlights the importance of an "anchor market", in the sense of a high income country that acts as a major source of demand and also of technology rich FDI (Shepherd, 2017b). On the export side, these markets—like the EU—are strong sources of demand, but also give producers an incentive to improve quality, an issue we return to below. On the import side, they are sources of technology embodied in capital goods and intermediate inputs, as well as inward FDI. Many factors go into the different paths of Rwanda and Mauritius with respect to the EU, but policy is one of them. The Eastern and Southern Africa EPA, which covers Mauritius, was signed in 2009 and has been provisionally applied since 2012. By contrast, the EAC EPA was signed in 2016, but has not yet entered into force. Clearly, the EPA is not the driving force behind Mauritius's trade costs with the EU, as they started declining well before the agreement could have had any effect. But integration policies can help reduce trade costs, so identifying key high income markets and signing ambitious trade agreements with a strong development component is one way that Rwanda could give added impulsion to an outward oriented growth strategy.

3.5 Trade Policy in Services

The services economy offers many potential advantages to Rwanda. From a comparative advantage standpoint, success is less driven by the availability of a large supply of labor, as is the case in light manufacturing. And from a trade point of view, services are attractive because there is scope to overcome distance and landlocked status by using technology to allow buyers and sellers to connect online. In addition, services are important inputs into the production of goods. Indeed, OECD-WTO TiVA data suggests that nearly 60% of total world trade in commercial services in in fact in intermediates. Examples of this kind of trade include "backbone" sectors like transport, communication, and finance: manufacturers purchase services from each of these sectors, and use them to produce competitive export goods. In a very real sense, these services are embodied in the final goods that are traded across borders. Hoekman and Shepherd (2017) have shown that boosting services productivity, including through

appropriate regulatory policies, has strong spillovers to the manufacturing sector, and can help boost exports.

Recent work by Shepherd et al. (2018) using a methodology developed by the OECD suggests that in the three key sectors reviewed—commercial banking, road freight transport, and distribution—Rwanda has relatively liberal services policies. The comparison with the large emerging markets for which data are available is typically favourable, as is the comparison with neighbouring Kenya. Indeed, in some areas, Rwanda compares well with some high income countries. In terms of policy settings, and based on this review of three sectors only, Rwanda appears to have many elements of the necessary framework in place to develop a competitive services sector.

Unlike the previous section on trade in goods, where we could present extensive data and comparisons, that task is far more difficult in the case of services. Few countries maintain complete data on trade in services. In Rwanda, as in many low and middle income countries, there are no data on bilateral trade in services at all. Transactions are only recorded with the rest of the world as a partner. As such, it is impossible to assess particular bilateral relationships as was done in the previous section. Similarly, with the exception of the report by Shepherd et al. (2018), there are no systematic data on services policies in Rwanda, again as is the case in most low and middle income countries. The government needs to give serious consideration to loosening this data constraint over time. We believe there is appetite and potential in sectors like business process outsourcing (BPO), and issues to be addressed in sectors like logistics. But in the absence of data, the research community—both local and external—is highly constrained in how much it can contribute to policy discussions. Collecting bilateral trade in services data would be a crucial first step to better understanding Rwanda's potential in trade in services, as nearly all analytical work on international trade requires the data to be disaggregated by partner country. A secondary priority is the systematic collection of policy data, preferably following an established methodology like the one developed by the OECD, so that policy settings can be compared with world leaders, and progress can be tracked by government and civil society over time.

Notwithstanding these data issues, we can use information on aggregate trade to provide a basic picture of Rwanda's services trade performance. Figure 20 shows that in relation to the comparators, Rwanda's growth has been very impressive: it has in fact seen the quickest rate of services export growth of any country in the group, a notably different position to what was seen above with trade in goods. Rwanda's performance is all the more impressive seen against the background of the little known fact that East and Southeast Asia's export boom in manufactured goods was in fact accompanied by a boom in services exports that was a crucial part of the rise of "Factory Asia" (Shepherd, Forthcoming). Of course, the size of Rwanda's services exports is still relatively small, only 8% as large as Mauritius's even though that country's population is only one tenth of Rwanda's. The key driver behind this difference is per capita income: it is widely recognized that economies tend to shift into services as they move into higher income categories. But the traditional model of first moving through a stage of a large manufacturing sector, up to one quarter or one third of the economy in some cases in the 20th Century, is perhaps being disrupted as lower-income economies move into services more quickly.

Figure 18: Total services exports, Rwanda and comparators, 2000-2012, index (2000 = 100).
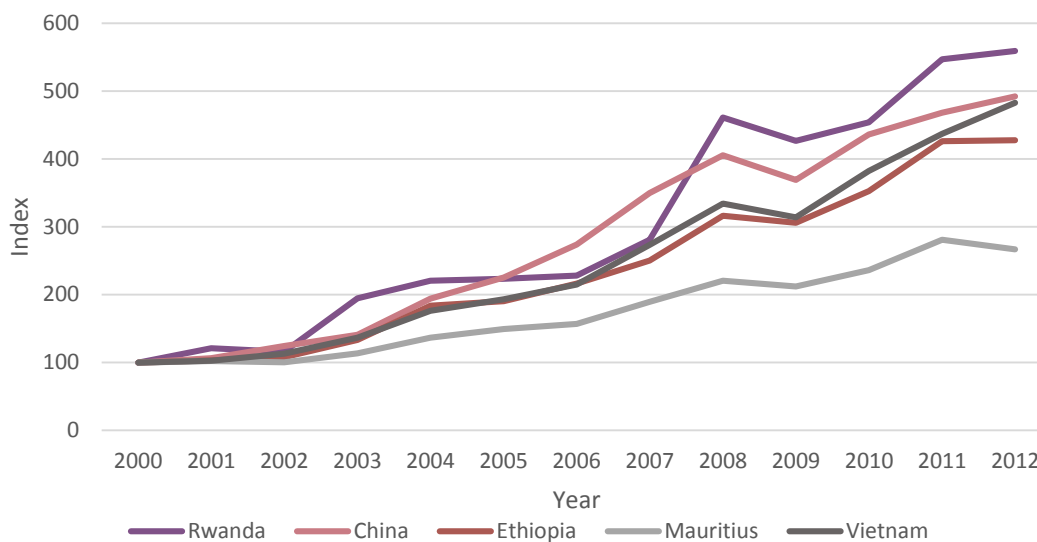
Source: OECD-WTO BATIS Database.

Further encouragement in relation to Rwanda's services economy is found in the sectoral breakdown of exports (Figure 21). In Asia, as well as in Ethiopia, transport services play a large role as a generator of services export earnings, but this type of trade is typically driven by increased need for international transportation of merchandise exports, and so is a type of derived demand fundamentally shaped by forces elsewhere in the economy. Rwanda's case is quite different. It has a relatively diversified services export structure, covering finance and insurance, travel (tourism), and other business services in addition to a smaller proportion of transport services. From a GVC perspective, sectors like finance and insurance and in particular other business services are key, as these are the areas in which services GVCs are arising. Rwanda's exports are made up of other business services to the extent of 22%, which is quite close to the comparable figure for India (28%), an acknowledged leader in integrating services GVCs.

Figure 19: Sectoral breakdown of services exports, Rwanda and comparators, 2012, percent.
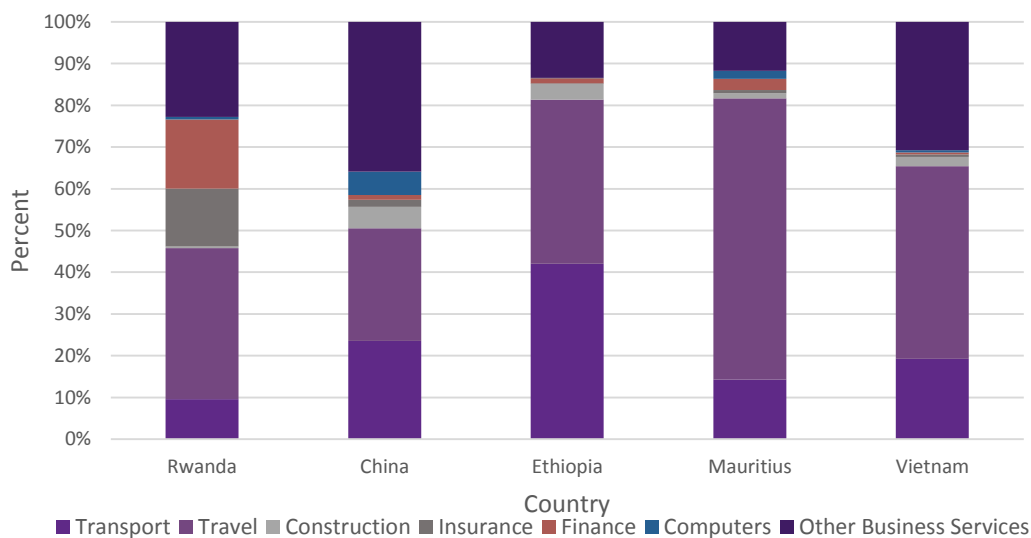
Source: OECD-WTO BATIS Database.

Figure 22 shows that Rwanda's performance in services is similarly impressive on the import side. As was the case for exports, it has seen the fastest import growth among the comparison group. This result is an important one, for the reasons set out above in relation to goods trade: in the GVC context, it is quite impossible to be a competitive exporter without also being a major importer.

Figure 20: Total services imports, Rwanda and comparators, 2000-2012, index (2000 = 100)

Source: OECD-WTO BATIS Database. Note: Contains estimated values.

Figure 23 shows the sectoral breakdown of services imports for Rwanda and the comparators. As in the case of exports, the sectoral distribution is skewed towards finance and insurance, as well as other business services. This type of two-way trade within broadly defined sectors is quite consistent with the emergence of GVCs in services sectors. Of course, this process is at an early stage of development in Rwanda, but the trends thus far suggest that there is considerable potential for an effective outward-oriented development strategy that gives a particular place to services.

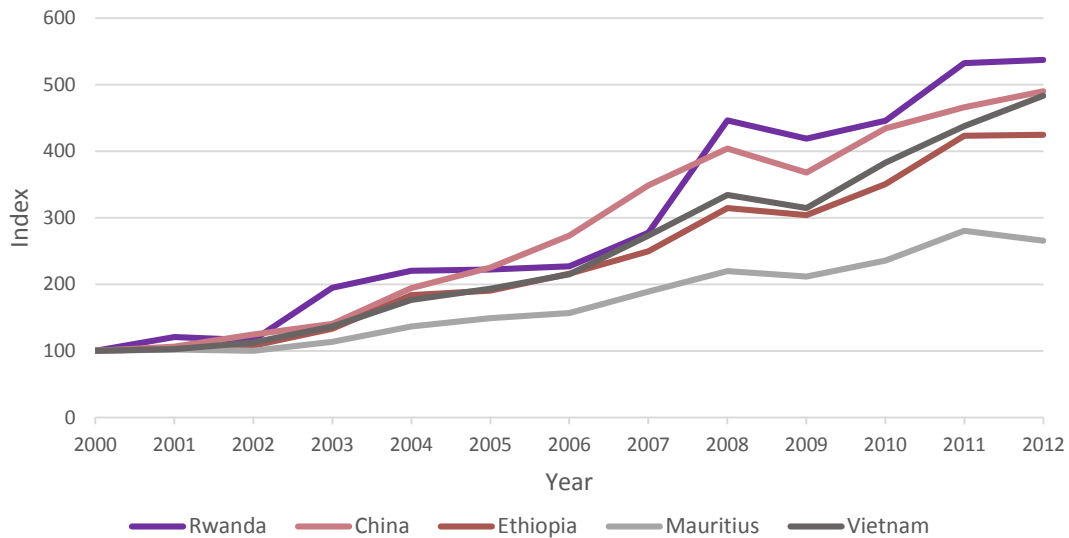**Figure 21: Sectoral breakdown of services imports, Rwanda and comparators, 2012, percent**
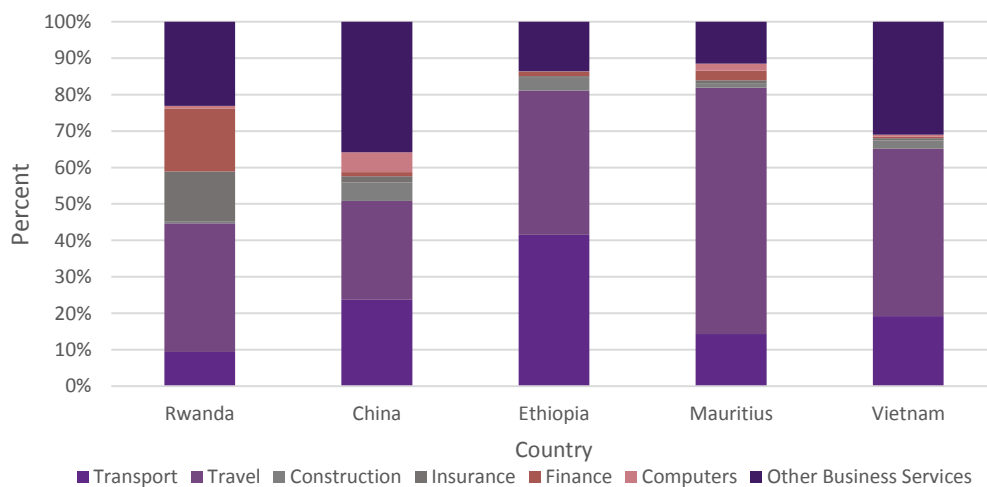
Source: OECD-WTO BATIS Database. Note: Contains estimated values.

The data make clear that services is an area of major potential for Rwanda. It also has the important advantage of allowing for a much more independent trade policy than in the case of goods. Although there are ongoing efforts to integrate services markets in the EAC, there is no equivalent of the CET for goods. And as a result, there are no issues with unduly high levels of policy restrictiveness stemming from political economy sensitivities in other countries. On an MFN basis, Rwanda is much freer in services than in goods to adopt a liberal policy that facilitates joining GVCs. Building on emerging experience in finance and insurance, as well as BPO, lays the foundation for moving up into higher value added activities over time in line with medium- to long-term plans to develop human capital. Moving up in this context means development of more knowledge intensive services activities. Such a process is underway in India, although for quite different reasons. In theory, India's large pool of low- and semi-skilled labour should give it a strong comparative advantage in light manufacturing. But because of its historical development path, which privileged heavy industry, and most importantly its restrictive regulatory environment, particularly in the area of labour laws, it has been unable to exploit that potential to the fullest extent. Its BPO sector grew out of the opportunities presented by the combination of new technologies and the relative absence of governmental intervention. Working from that basis, Indian firms are now competing in knowledge process outsourcing (KPO) industries, taking advantage of the country's historically strong, albeit limited in numerical terms, higher education sector.

It is clearly important for Rwanda to ensure that manufacturing activities can develop according to the observed pattern of comparative advantage, but the services sector offers many advantages given its small population and challenging geography. In the context of emerging services GVCs, Rwanda's industrial policy should not focus only on manufacturing but should also include commercial services. It needs to focus on laying the groundwork for short- to medium- term development of sectors like BPO and finance and insurance by ensuring regulatory settings are appropriate, particularly in relation to foreign investment. Over the longer term, investments in education will lay the groundwork for moving up into higher value added activities.

3.6 Technology, Innovation, and Risk Taking

As is understandable in a post-conflict environment, Rwanda's government initially played a leading role in rebuilding and energizing the economy through demand side and direct interventions. However, experience elsewhere, including in formerly centrally planned economies like China and Vietnam, is that only the private sector can drive rapid productivity growth over the long term. Government can play a facilitating role, it can deal with market failures, and it can adapt regulatory strategies to emerging situations, but it cannot substitute for the private sector in terms of directly producing and supplying goods and services to consumers and businesses at home and abroad, at least not in a way that is consistent with sustained productivity upgrading. Through the various instruments of industrial policy, governments can exercise a profound influence over the shape and extent of structural transformation within their borders, but policies should be based on a rigorous assessment of costs and benefits.

One consequence of the government's leadership role in some sectors of the Rwandan economy is that there is a perception, reported in interviews, that private sector firms are eager for the security of a government contract, and are not ready to take the risks involved in developing new products and services (innovation). Economies in the early stages of industrialization typically "import innovation", in the sense that technological advancement occurs most frequently through imports of foreign technology embodied in capital goods and intermediate inputs. But even in low income economies, incremental innovations, either adapting goods and services to local conditions, or adapting business processes within the same framework, are an important way in which a process of self-sustaining innovation can be started. That

process is crucial to an economy's long term growth potential: essentially the only durable way to pass from middle- to high-income status is through fully embracing the innovation economy.

It is difficult to observe innovation activity directly.[2] But the World Bank's Enterprise Surveys can provide some basic information on the extent to which firms use technology licensed from a foreign partner, which would usually be associated with either product or process innovation. Figure 24 shows results. Comparison is difficult because the data are not observed at the same time: Rwanda's most recent survey was in 2011, for example, whereas the latest for Mauritius was 2009, but for Ethiopia was 2015. Results should therefore be interpreted cautiously. Nonetheless, despite the CET's sometimes unexpectedly high tariffs on capital goods, Rwandan firms have the highest rate of licensing technology of any of the countries under consideration. We do not know anything about the nature or origin of the technologies involved, and the sample is small: in fact the percentage is based on 16 firms out of 343 indicating that they license foreign technology. But this piece of evidence is encouraging, as it suggests that a culture of productivity upgrading is being developed in Rwanda, albeit at small scale, and typically among larger firms (which are over-sampled in the Enterprise Surveys data).

Figure 22: Percentage of firms indicating that they license technology from a foreign firm, Rwanda and comparator countries, latest available year.
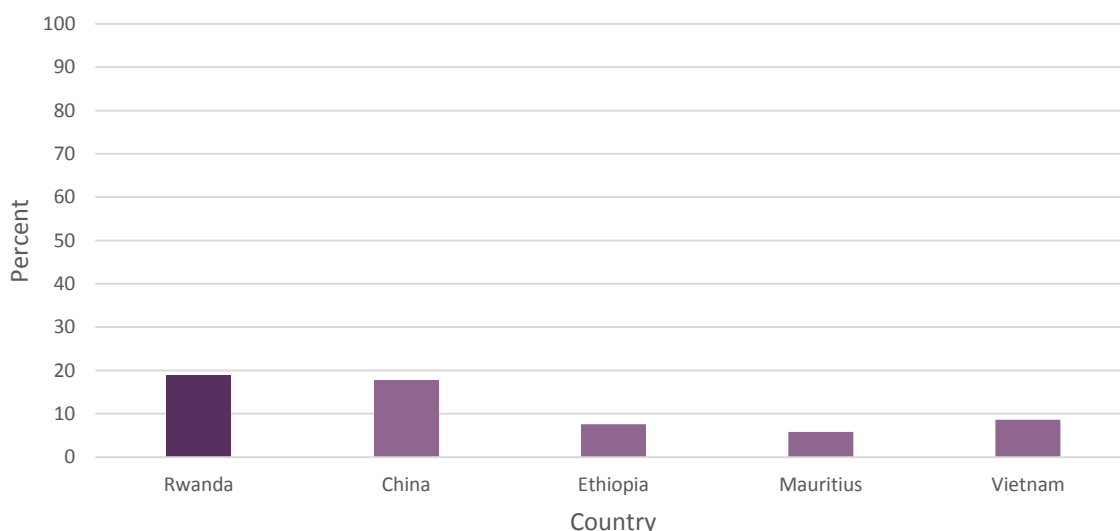
Source: World Bank Enterprise Surveys. Note: Averages apply sampling weights.

Anecdotally, though, Rwandan firms face considerable difficulties in upgrading their technology, either by acquiring foreign technology or innovating themselves. One is the culture of looking for secure government contracts, referred to above, which tends to disincentivize innovation. Another is the difficulty of accessing finance to cover innovative activity, whether it be a start-up entering a new sector, or an established firm looking to introduce a new product or service. Detailed analytical work at the micro-level is needed to establish exactly why this happens. But the answer likely lies in a mix of financial conditions—with interest rates relatively high by world standards—and risk aversion, both in the industrial sector and the financial sector. The net effect for manufacturing firms is summarized in Figure 25, which is based on an Enterprise Surveys question that asks firms to indicate how severe an obstacle

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[2] The World Bank's Enterprise Surveys unit has run firm-level innovation surveys in selected economies, including Rwanda. But the sample—81 firms—is too small to provide meaningful information.

to their operations access to finance is. The average response in Rwanda is that it is a moderate obstacle, whereas the degree of difficulty of accessing finance is seemingly much less in the comparator countries with the exception of Mauritius. In interpreting these results, it is important to keep in mind that the Enterprise Surveys oversample large firms, only deal with formal sector firms, and by definition focus on firms that have successfully stayed in the market. In other words, we do not observe firms that either never entered at all or entered but then exited due to problems accessing finance.

Box 4: The Role of NIRDA in Supporting Innovation

The National Industrial Research and Development Agency (NIRDA), set up in 2013, is working to address three main challenges to technology and innovation adoption in Rwanda: low-skilled human capital, barriers to accessing finance and weak institutional links for generating and disseminating government research to the private sector.

To address these challenges, NIRDA aims to be a one-stop centre for private sector support for knowledge and technology monitoring, acquisition and generation.
In July 2018, NIRDA launched an open call for firms at any part of the Banana wine and garment value chains to apply for technology, management and business development support from NIRDA. The open call is a proof of concept for NIRDA's firm-level development strategies and will be evaluated in 2019 after the first cohort of firms completes the program.

NIRDA is also working on applied research and development for new and existing value chains by providing a physical space for research alongside knowledge management and generation. The three areas of focus are energetics, mechatronics and industrial software systems with a focus on data analytics. There are also plans for collaboration with existing research organisations that have research capacity and would be interested in expanding to Rwanda. All of NIRDA's efforts in applied research and development will fall under NIRDA's STEM (science, technology and math) Lab.

Figure 23: Average response (0 no obstacle, 4 very severe obstacle) to the question does access to finance represent an obstacle to the firm's operations, latest available year
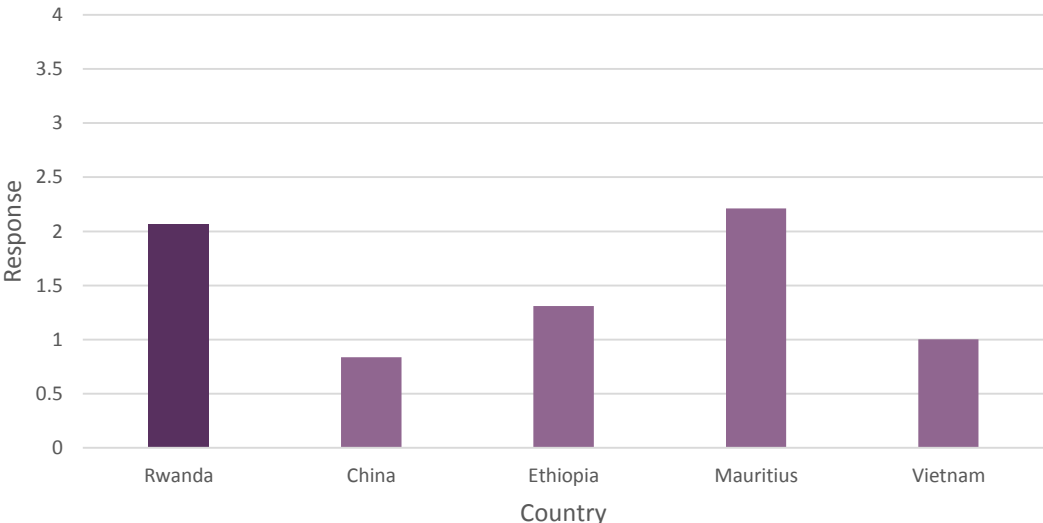
Source: World Bank Enterprise Surveys. Note: Averages apply sampling weights.

The nature of the financing constraint comes out even more clearly in Figure 26, which shows domestic credit to the private sector relative to GDP. Although there is a slight upwards trend in the case of Rwanda, the figure has been stable at around 20% for the last few years. By contrast, the comparable figure in Mauritius is 102%, in Vietnam is 131%, and in China is 156%. Of course, this number is not one that should increase without bound: lending is by its nature a risky activity, so it is important that domestic credit growth not outstrip what is reasonable given the level of risk associated with the commercial environment and specific transactions. But even so, Rwanda's low level of domestic credit and in particular the slow growth path suggests that there is a difficulty in mobilizing funds to cover risky, but possibly profitable, commercial opportunities.

Figure 24: Domestic credit to the private sector relative to GDP, Rwanda and comparators, 2000-2017
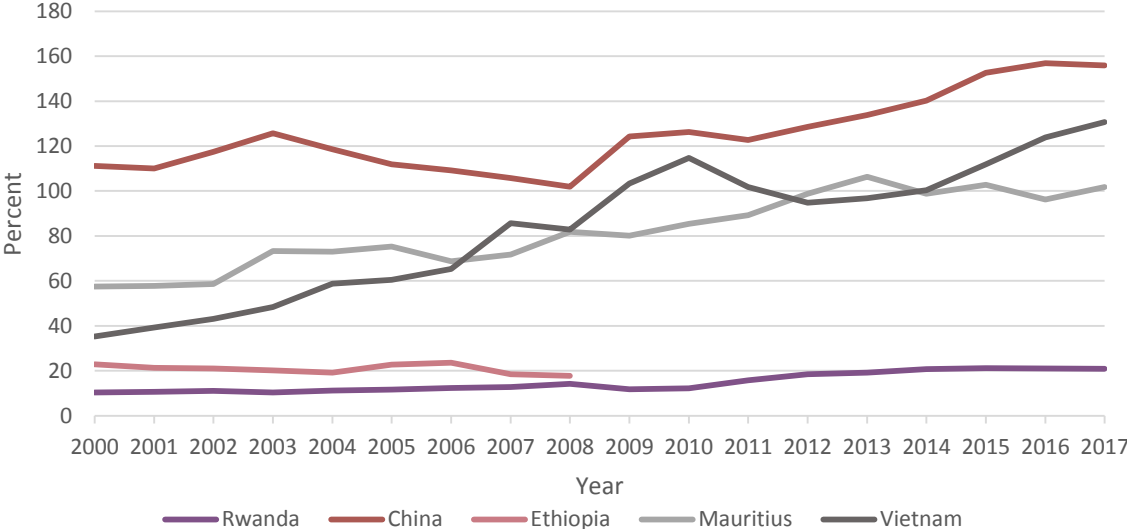
Source: World Development Indicators.

The reason for the low rate of domestic credit growth is likely a mix of supply-side and demand-side factors. On the supply side, Rwanda's real interest rate is much higher than in the comparator countries, although it has come down significantly since its peak in 2015 (Figure 27). Nonetheless, the rate of return on an investment required to repay a loan at even 10% above inflation makes it very difficult for companies to finance major investment programs. On the demand side, part of what has driven rapid domestic credit growth in East and Southeast Asia is the need for factories to expand to serve ever larger sources of demand in the world market. As seen above, Rwanda's industrial sector is less focused on world markets than the comparator countries, and relatively more focused on regional and local markets. Anecdotally it was suggested that factories are typically operating well below capacity, which means that there is no need to expand production facilities to meet rising demand. We cannot confirm this with hard data, as although the Enterprise Surveys contain a question on capacity utilization, no Rwandan firms answered it. This may well be consistent either with difficulties in assessing capacity utilization, or with a particularly low rate compared with the 80% - 90% seen in East and Southeast Asia.

Figure 25: Real interest rate in Rwanda and comparators, percent, 2000-2017
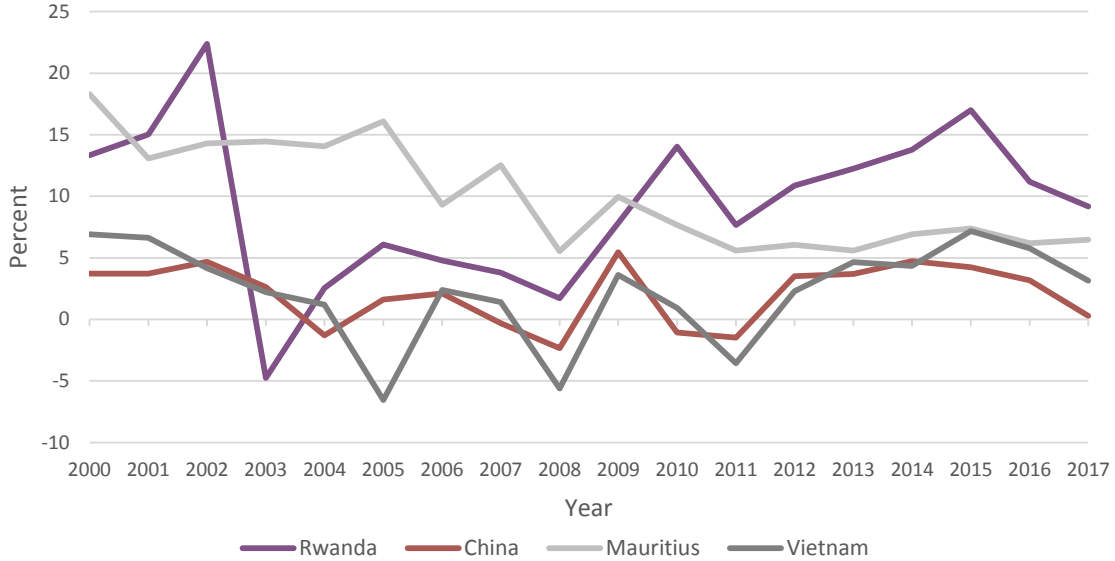
A necessary part of productivity growth is risk-taking. Companies need to invest in productive capacity such as new equipment or processes, or even taking on more workers, against a background of uncertainty regarding the future path of demand. One key function of the financial system is to ensure that funds are available to cover short term losses that may accrue before a firm can realize medium-term gains from productive upgrading. Based on data and anecdotal evidence, it seems that risk taking behavior in Rwanda is significantly constrained for the reasons set out above: a historical preference for government contracts, high real interest rates, and a lack of focus on worldwide demand growth as a source of expansion possibilities. Designing policies to influence these factors is not simple, but there are a number of issues to consider. First, reducing the government's role as a source of final expenditure would force firms to become more reliant on private demand. The proportion of government final consumption expenditure in GDP is not unduly high in Rwanda—it is similar to levels seen in the African comparators, for example—but it is significantly above what is seen in Asian comparators, which have historically had a very large role for the government in planning the economy. Rather than cutting back significantly on spending, the emphasis could perhaps be on reorienting it away from guided interventions as a source of demand for local firms, and towards policy interventions and support mechanisms that help support productivity upgrading.

Traditionally, governments have used patents to spur innovation by offering inventors a temporary monopoly over the fruits of their invention. The rationale is that from an economic point of view, new technology has positive externalities, which means that it will be undersupplied in a free market equilibrium. Patents have disadvantages as well, however. First, it is important for the system to cover process innovation (utility patents) as well as inventions in the material sense. This feature is all the more important in developing countries, where most innovation in the early stages of industrialization is process related. Second, patents, particularly in small markets, can create barriers to entry that ultimately hold back future innovation. There is naturally a role for patents in encouraging innovation in Rwanda—and experience in China shows that utility patent systems geared to the needs of SMEs can be highly beneficial (Shepherd et al., 2015)—but government should look at other mechanisms as well. One potential policy that should be explored is the use of innovation prizes, which has been gathering momentum primarily in

developed countries in recent years. The idea is simple: the government pre-announces a financial incentive for a given innovation, then entrepreneurs and inventors compete to be the first to reach the goal. The most high-profile use has been in the area of vaccines for under-researched diseases, but the concept is far more broadly applicable than that. Working with value chain actors, the government could identify key points where innovations—potentially even quite small ones—are lacking, then act to incentivize firms to fill the gap. This approach would be one way of overcoming in the short term the high cost of risk capital, and would work alongside other proposed mechanisms, such as an expansion of the venture capital market.

3.7   Digital Economy

As noted above, Rwanda, as a landlocked country, needs to pay particular attention to the issue of trade costs, which impede its firms' ability to access international markets either to sell their output or to source high quality inputs at reasonable cost. The digital economy can help lower trade costs in at least two ways. Of course, the digital economy is about much more than just facilitating existing types of trade, and we return to this point below to look at other ways in which the digital economy could be considered within Rwanda's industrial policy.

On the one hand, there is evidence that online platforms lower the negative effect of geographical distance on international trade in goods (Lendle et al., 2016). The mechanism appears to be that online platforms lower the search costs faced by potential purchasers. There is also benefit from the reputational mechanisms embedded within most online platforms, which further reduce the negative effect of distance on trade flows. This point is of importance for Rwanda as it seeks to establish itself in international markets, and in particular to link to GVCs. Historically, countries have used aggressive investment and trade promotion efforts to overcome search costs and information asymmetries in international markets, but these efforts are costly and difficult to target, although there is evidence that they can sometimes bear fruit.[3] Incentivizing producers, particularly SMEs, to use online platforms is a relatively low-cost intervention that do much to link Rwandan firms to international markets in the short term.

A second mechanism by which the digital economy can reduce the effects of geographical isolation is by facilitating cross-border services trade through electronic means. Not all services can be easily traded in this way, but the number that can be is constantly growing due to improvements in technology and changes in business practices. As shown above, Rwanda has seen very strong growth in its services trade, so with the right policies in place to favour development of the digital economy as part of its industrial policy, it could benefit from an even greater degree of integration into international services markets.

Clearly, infrastructure development is an important part of facilitating the digital economy, and it requires government support. Figure 28 shows that Rwanda has been increasing the proportion of the population with internet access—an indicator of infrastructure rollout—at a rapid rate, but coverage is still far below the rates seen in Mauritius or the East and Southeast Asian comparators. Doubling down on investments in technological infrastructure is key to unlocking Rwanda's potential in the digital economy, including in the two areas identified above.

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[3] In the case of investment promotion, Harding and Javorcik (2011) show that such efforts can increase FDI inflows, but the effect is primarily for countries where red tape and information asymmetries are likely to be severe. Cadot et al. (2015) show that export promotion efforts tend to lead to trade boosts in the short run, but that the effects are not durable.

Figure 26: Percentage of the population with internet access, Rwanda and comparators, 2000-2016
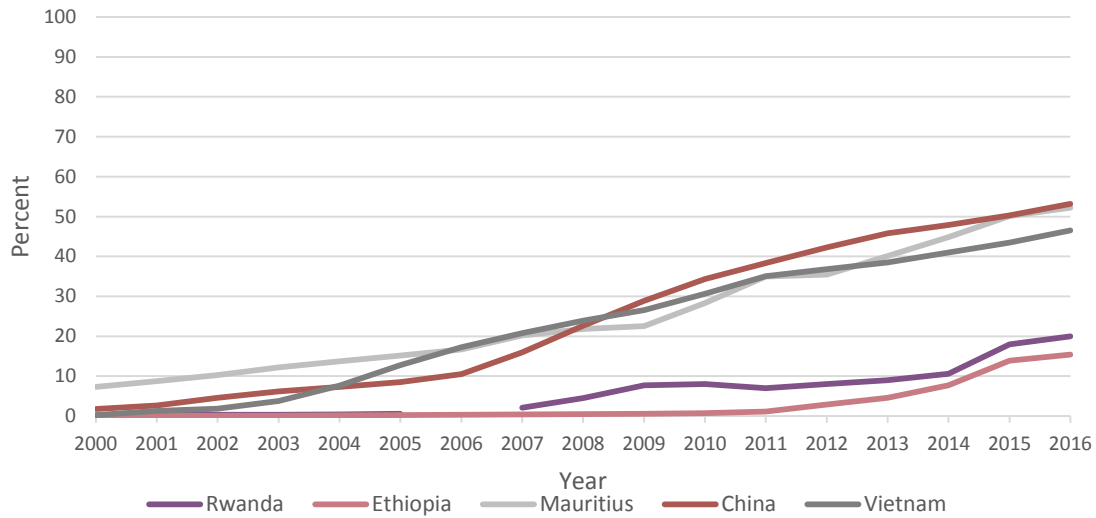
Source: World Development Indicators.

At the same time, there is a particular human capital challenge, as producers need to become familiar with online tools and develop competence in their use. In the absence of technological skills among managers and workers, valuable opportunities in the digital economy will be missed. This process appears to be well underway in Rwanda. Figure 29, based on firm-level survey data, suggests that uptake rates of email are comparable to what is seen in the comparators, although strangely email is less used in services sectors than in manufacturing. By contrast, the percentage of firms with a website, although largely comparable to the African comparators, is much lower than in East and Southeast Asia, and is again lower in services than in goods. This area is one where government intervention both to support infrastructure rollout and also to help build human capital could potentially bear significant fruit for the ability of Rwandan firms to engage with the world economy, and thereby develop the country's industrial fabric.

Figure 27: Percentage of firms with email or a website, by sector, Rwanda and comparator countries, latest available year
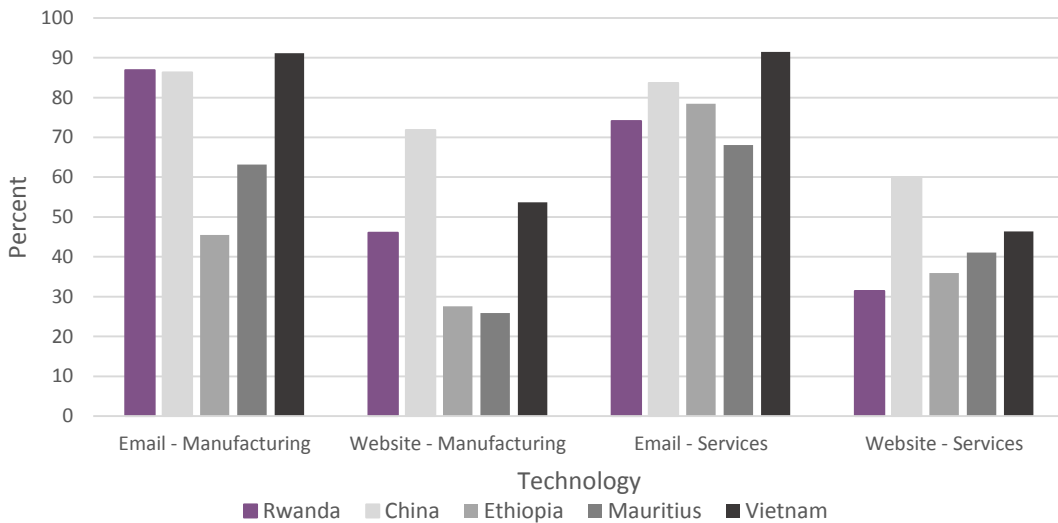
Source: World Bank Enterprise Surveys. Note: Sampling weights applied.

Outside the realm of facilitating trade, the digital economy could also be part of a more general effort to upgrade productivity in the industrial sector (goods and commercial services). New technologies in general, and including in the digital arena, offer the perspective of process innovation, as well as innovation in services and in the bundling together of goods and services. New production technologies in manufacturing are intensive in their use of services, including digital services, and this trend is only likely to continue as new production processes like additive manufacturing (3D printing) are rolled out at larger scale and in more and more sectors (Hallward-Driemeier and Nayyar, 2017). The evolution of this process and its implications for newly industrializing countries are unclear, but given Rwanda's existing commitment to expanding internet access and the proposal made here to refocus industrial policy on productivity upgrading, there is scope for new technologies under the general heading of the Fourth Industrial Revolution to support industrialization and income growth. The government's role is to provide support for that process through infrastructure investment and maintenance, human capital development, and more pointed interventions through industrial development agencies that can help mobilize expertise to support uptake among firms on the ground.

3.8 Green Economy

Industrial development has historically involved a gradual transition to heavier industries, with accompanying pollution and environmental degradation. Even recent industrializers like China and Vietnam have seen significant environmental problems as a result of their industrial development. Rwanda is in an unusual position, as it is a small country geographically, and one that is reliant on unique environmental factors to support its important and growing tourism industry. Moreover, within the context of the UN Sustainable Development Goals (SDGs), it is important for Rwanda to take account of environmental sustainability in developing its industrial sector.

While not part of industrial policy in the strict sense, environmental regulations need to be developed to deal with the new challenges posed by rapid industrialization. While regulations should not be overly burdensome in terms of administrative costs for firms, they should ensure that environmental externalities are internalized. Given the salience of the green economy around the world, there is scope to use environmental regulation positively, to help develop new sectors with niche appeal based on sustainability characteristics. In the coffee market for example, Rwanda has already started to do this, by developing certified organic and shade grown coffee. Experience suggests that there are also opportunities in mass markets like apparel to emphasize resource use, organic origin, and sustainability. Collaborative work between national industrial development agencies and international governmental and non-governmental partners could help Rwanda leverage these opportunities to ally industrial development and environmental sustainability. There is a close link to the development of quality infrastructure, discussed above, as compliance with international standards and certification requirements is a key part of signaling in new markets that Rwandan producers respect environmental norms in a way that producers from other countries may not.

3.9 Backward Linkages and Supplier Development

There is an understandable interest in government circles, as in other developing countries, with the development of linkages between final goods and services producers and suppliers. Clearly, the development impact of foreign investment in particular is limited if the investor does not develop backward linkages with the rest of the economy, and effectively operates as an enclave. Given that Rwanda has been growing its mining sector in recent years, this concern is of particular salience, as

extractive industries are a sector where development of backward linkages has been particularly challenging in many countries.

On the one hand, some of the policies discussed above can help incentivize firms to develop backward linkages. Improving the cost, ease, and reliability of contract enforcement looms large. Similarly, government agencies can play a role in helping reduce information asymmetries between foreign investors and small, local firms that could potentially be suppliers: in line with the value chain development model discussed above, government, through industrial development agencies and quality infrastructure, can help smaller firms develop their productive capacity and comply with relevant standards, which signals to larger firms that they are a reliable partner with which they can develop a long-term relationship. Encouraging these kinds of relationship specific investments is key to ensuring that GVCs make a durable investment in Rwanda. Over the medium- to long-term, these kinds of sunk costs are likely to play a bigger role in ensuring that lead firms maintain their networks in-country than temporary incentive packages, even generous ones.

It is necessary to address local content requirements, which oblige foreign investors to source particular percentages of their inputs from local suppliers. First, these measures are illegal under the WTO's TRIMS Agreement; pursuit of such measures would therefore invite dispute settlement proceedings, and potential retaliation, from trading partners which consider they have been adversely affected. Against this legal background, the challenge for supplier development policies is to promote backward linkages without imposing explicit local content requirements. Second, even apart from the legal question, local content requirements can undermine the competitiveness of the producer of final goods or services if local inputs are either more expensive or of lesser quality than those available from the world market. The objective should be to support local input producers to comply with world market requirements, and then to break down information asymmetries that may keep lead firms from entering into mutually beneficial contracts with them.

There is evidence that entry by major multinational firms can help develop supplier capacity, but it is not a process that is free from pain in a political economy sense. Javorcik et al. (2008) undertake a case study of the Mexican soaps, detergents, and surfactants industry following entry by Walmart post-NAFTA. They find that Walmart's entry contributed to a reorganization of the sector, where firms were forced to either cut margins or innovate. Those producers that could not deal appropriately with the new environment lost market share, while innovative producers grew—and saw impressive gains in productivity, fuelled to a significant extent by innovation. Lacovone et al. (2011) generalize the approach to look at a wider range of consumer goods sectors. Based on the discussion in Section 2, this is exactly the kind of process that Rwanda needs to undergo in key industrial sectors, to move onto a path of rapidly increasing within-sector productivity. As noted above, part of the purpose of industrial policy in the modern context should be to let less productive firms shrink and release resources that can be better used by more productive firms. The Walmart example suggests that distribution is a key sector that can help bring this about in the area of consumer goods. Significantly, these positive results took place against a background of regional and multilateral trade liberalization at the same time.

The distribution sector is indeed a key sector from a number of perspectives. In addition to the scope to bring about productivity upgrading in domestic consumer goods markets, large distributors can also help develop the logistics sector, and improve domestic and international connectivity. Shepherd et al. (2018) show that Rwanda's distribution sector regulations are quite liberal by the standards of emerging markets, and even relative to certain OECD markets. The main point of issue is discrimination in public procurement, with measures designed to favour local firms. Like local content requirements,

discrimination in public procurement can ultimately undermine competitiveness by shifting input sourcing to relatively high cost or low-quality producers, and away from the best available sources. However, this measure is widely practiced in developed and developing countries alike, and is only prohibited under WTO law for signatories of the Government Procurement Agreement (primarily developed countries, and not including Rwanda). While there is thus no legal issue with these measures, their economic rationale is at best unclear.

While the discussion here has highlighted distribution, it is likely that entry by large firms in other sectors can have similar effects, provided that the right policy settings are in place to favour long term supply contracts. We have already discussed this policy dimension, but it is important to stress that final producers also need guarantees of regular, standardized supplies in order to make such arrangements commercially viable. There is therefore an agenda for industrial development agencies in working with local suppliers to build productive capacity, perhaps emphasizing management training at all points in the value chain to help ensure that supply can be ensured on a regular and consistent basis. Such programs need to be designed and evaluated carefully, however, as the balance of evidence suggests that effects are typically modest (McKenzie and Woodruff, 2013).

Another intervention that can potentially help boost linkages among firms within a value chain is the promotion of clusters within Special Economic Zones (SEZs) and Industrial Parks. This is an area where Rwanda is already moving forward, but it will be important to evaluate these programs rigorously to assess which interventions have been most useful in terms of helping firms in these locations sustainably boost productivity. Again, the government cannot oblige firms to form linkages if there is no strong commercial rationale to do so. But developing locations that respond to the needs of particular value chains—in some cases information technology infrastructure, in others electricity, in others expedited approval of construction permits, etc.—can help make those connections more likely from a commercial standpoint.

Box 5: Firm Level Impact of Kigali Special Economic Zone

In an effort to boost industry, Rwanda established the Special Economic Zone (SEZ) regulatory framework and legislation in 2010 and 2011 respectively to lay the groundwork for harnessing the potential of SEZs. The Kigali Free Trade Zone and Kigali Industrial Parks Project were combined to form the Kigali Special Economic Zone (KSEZ). The Government's vision was that the KSEZ would increase firm performance through the provision of quality infrastructure, streamlined business regulations and incentives.

IGC research finds that the KSEZ has had a significant effect on firms' overall performance in the first six quarters (18 months) of being in the KSEZ. Moving into the KSEZ is associated with larger increase in sales, value-added and permanent employment numbers than would have been the case had such firms not moved there. Yet, when one considers the effect on trade, you find that the increase in KSEZ firm output is driven mostly by domestic sales.

Indeed, while KSEZ may attract exporters, it does not appear to increase the likelihood of any firm to become an exporter, or to increase their overall exports as a result of being in the KSEZ. In contrast, we find that firms moving into the KSEZ are more likely to import goods, and also choose to import a higher value goods than other firms. Potential mechanisms for this observed positive effects are:
a. Trade is easier because from an IGC survey of firms they have access to expedited customs procedures and a higher success rate of Stay of applications for the Duty Remission program under the EAC's Common External Tariff. KSEZ might serve as a strong signal for firm quality and profit potential.

b. KSEZ gives firms relatively better access to infrastructure central to firms operations. Good road networks make it easier for firms to transport inputs to factories and outputs to market. Reliable and affordable access to utilities- primarily electricity and water lowers the financial cost of doing business as well as operational uncertainty.

c. KSEZ receives strong support from the government thus firms have more chances to interact with the Rwanda Revenue Authority, Rwanda Development Board among others. As a result, firms seem better aware of government policy, firm rights and development programs.

Despite these positive effects, firms who wish to set up in the KSEZ still complain about the high price of land. Public transportation for workers is also a pain point for firms and increases the cost of moving labour. Part of the selling point for KSEZ is reliable and affordable power however energy capacity is still lacking, and some firms use transformers to meet their energy needs. Water access is also under capacity with spotty coverage. IGC recommends that GOR address these pain points as it thinks about setting up additional SEZs. Beyond the provision of basic infrastructure, GOR should also look at facilitating knowledge spillovers and business linkages for firms through regular meetings with firms and a deliberate incubation to connect KSEZ firms with firms outside the zone.

Reference: Steenbergen, Victor and Javorcik, Beata. 2017

3.10 Dealing with Sectoral Specificities

The discussion thus far has largely been framed in general terms. Indeed, a key suggestion that flows from the above perspective is that it is possible to design industrial policy in a way that focuses on general concepts, like market failures or institutions, and therefore keeps policy focused on necessary interventions on a cost/benefit basis, rather than attempting to "pick winners" in the way that much traditional industrial policy tried, and often failed, to do.

We are conscious, however, that many of the issues we have mentioned inevitably play out in different ways in different sectors. Similarly, some sectors are more of a priority than others from the point of view of industrial development, which in turn means that priority can be given to dealing with these general issues within those specific contexts, rather than attempting to work on all markets simultaneously. As noted at the outset, the key unit of analysis here is the value chain: in identifying sectors that offer particular promise, as well as in designing solutions for concrete problems, government should be guided by a holistic view of the value chain, being conscious in particular of the effects that interventions upstream can have on downstream firms. Government can play a significant role by helping value chain actors communicate with each other at different points, and develop relationships, but a value chain is inherently a private sector construct that government cannot create itself.

In this section, we use a quantitative analysis of Rwanda's pattern of comparative advantage in goods and services to motivate a discussion of sectors that may merit particular attention going forward. Comparative advantage is inherently a relative concept: it is not about absolute advantages in costs or productivity, but instead opportunity costs based on relative patterns of productivity. Costinot et al. (2012) develop a Ricardian trade theory in which bilateral flows are determined by the interplay between sectoral productivity in exporting countries, sectoral demand in importing countries, and bilateral trade costs. We apply their approach to recent data on trade in goods and services to identify sectors where Rwanda potentially enjoys a comparative advantage, and through that analysis we track recent evolutions in revealed productivity. This measure is a theoretical analogue of the traditional Revealed Comparative Advantage measure, but picks up important features that the latter does not, in particular that there is not a strict cutoff between comparative advantage and comparative disadvantage goods, but instead that

pairs of goods need to be compared across countries. Second, the traditional index is only relevant in a world without country- and sector-varying trade costs, which is not realistic. The approach used here takes full account of those differences.

3.10.1 Goods Sectors

For goods, we analyze patterns of comparative advantage in Rwanda's trade data from 2000 to 2015, focusing for reporting purposes on 2010-2016. We work at the ISIC four digit level with a database of over 14 million observations, and apply the econometric model developed by Costinot et al. (2012) to derive a measure of productivity-based (Ricardian) comparative advantage by disaggregated sector. The measure needs to be normalized, so we take cereals as the baseline sector and set it equal to one in each year. All other sectors' productivity levels are therefore expressed relative to cereals.

Table 1 shows revealed productivity levels relative to cereals production, focusing only on those sectors that have exhibited a score greater than one (i.e., comparative advantage relative to cereals) for at least one year between 2010 and 2016. The table is ordered by 2016 index score, so sectors with the strongest comparative advantage are listed first. We have removed some sectors with very small reported trade flows where we do not believe Rwanda has productive capacity, and which are likely due to either misclassification in import markets, or tax optimization strategies by companies rather than economically meaningful trade.

It is apparent from the table that even products where Rwanda has a comparative advantage relative to cereals in one year are not always traded in subsequent years. By nature of being a small, developing economy, Rwanda's trade flows are difficult to predict because they often depend on the fate of a very small number of firms, and relatively micro-level determinants and transactions. For policy purposes, we advise concentrating on sectors where the pattern of trade and of comparative advantage is durable. Specific examples, moving down the table, include mining; primary agriculture (fruits, nuts beverages, and spices; animal farming) and forestry; textiles and leather; processed foods (dairy products, starches, grain milling, meat products, oils and fats, liquors, processed fruits and vegetables, alcohol, and fish products); light manufacturing (plastics, jewelry, metal goods, electronics, machinery, instruments, bicycles, and wood products); and some heavy manufacturing sectors (pesticides, fertilizers, and cement).

Table 1: Revealed productivity relative to cereals, by ISIC 4-digit sector, Rwanda, 2010-2016, index

Sector	Description	2010	2011	2012	2013	2014	2015	2016
1320	Mining of non-ferrous metal ores, except uranium and thorium ores	2.41	2.50	2.21	2.91	3.06	2.17	2.96
113	Growing of fruit, nuts, beverage and spice crops	1.51	1.43	1.73	1.89	1.78	1.49	1.84
200	Forestry, logging and related service activities	1.47	1.68	1.59	2.15	1.48	0.86	1.67
1911	Tanning and dressing of leather	1.29	1.48	1.61	1.74	2.12	1.12	1.66
2413	Manufacture of plastics in primary forms and of synthetic rubber		0.75		0.51	1.30		1.29
1520	Manufacture of dairy products	0.73	0.58	0.80	0.80	1.22	0.96	1.25
1532	Manufacture of starches and starch products	0.63			0.80		0.72	1.24
1429	Other mining and quarrying n.e.c.	1.22	1.07	0.90	0.92	1.04	0.82	1.23
3691	Manufacture of jewelry and related articles	0.82	0.69	0.88	0.67	1.25	0.81	1.15
2924	Manufacture of machinery for mining, quarrying and construction	0.63	0.69	0.74	1.36	0.77	0.66	1.15
9999	Goods not elsewhere classified	0.71	0.97	1.08	1.06	1.14	0.85	1.13
1549	Manufacture of other food products n.e.c.	1.02	1.05	1.12	1.11	1.03	0.82	1.10
122	Other animal farming; production of animal products n.e.c.	1.01	0.47	0.93	1.08	0.71	0.82	1.03
3410	Manufacture of motor vehicles	0.88	0.73	0.99	0.99	1.12	0.87	1.01
1711	Preparation and spinning of textile fibers; weaving of textiles	0.99	0.88	1.06	0.86	1.23	0.97	0.98
2421	Manufacture of pesticides and other agro-chemical products	1.21	0.83	1.27		0.70	0.51	0.97
2720	Manufacture of basic precious and non-ferrous metals	1.12	0.80	0.97	0.79	0.86	1.20	0.97
1531	Manufacture of grain mill products	0.92	0.89	0.94	1.14	0.97	0.88	0.95
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraph	0.84	0.64	0.78	0.92	1.00	0.88	0.95
1511	Production, processing and preserving of meat and meat products	1.06	1.12	1.53	2.08	1.55	1.29	0.95
2710	Manufacture of basic iron and steel	0.96	1.12	1.10	0.73	0.90	0.71	0.93
1514	Manufacture of vegetable and animal oils and fats	0.86	0.61		0.79	0.95	1.01	0.87
1553	Manufacture of malt liquors and malt	0.59	0.80	0.92	0.97	1.16	0.62	0.79
1513	Processing and preserving of fruit and vegetables	0.77	0.87	0.81	1.00	1.09	0.84	0.78
3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes	0.57	0.58	1.04	0.65	0.70	0.65	0.76
2922	Manufacture of machine-tools	0.76	0.59	0.61	1.05	1.20	0.60	0.75

Sector	Description	2010	2011	2012	2013	2014	2015	2016
1551	Distilling, rectifying and blending of spirits; ethyl alcohol production from fermented materials		0.57			1.10		0.62
3592	Manufacture of bicycles and invalid carriages	0.50	0.58	0.51	1.02	0.76	0.61	0.62
2412	Manufacture of fertilizers and nitrogen compounds	0.59		1.12	1.08	0.53	0.26	0.50
1512	Processing and preserving of fish and fish products	0.62	0.92			1.18	1.02	
2010	Sawmilling and planing of wood	0.79	0.83			1.70		
2021	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board and other panels an	1.27	0.63			0.59	0.48	
2694	Manufacture of cement, lime and plaster			1.47	1.04	0.83		

Source: Authors' calculations. Note: All indices expressed relative to cereals (1.00). Calculated as in Costinot et al. (2012) using mirror export data from UN Comtrade accessed via WITS.

Each of the sectors identified above, even those involving primary production, can be understood through a value chain lens. Although GVCs were first identified in manufacturing sectors like electronics and motor vehicles, the GVC framework has also been used to better understand markets for food staples in Africa (e.g., Maur and Shepherd, 2015). We believe this framework is an appropriate way for government to conceptualize development of these sectors, and to deal with actors at different points in each value chain. The objective should be to upgrade productivity along the value chain, focusing in particular on activities where Rwanda appears to have a comparative advantage, but also paying close attention to downstream linkages and the potential for reaping productivity gains from upstream improvements.

Mining presents an interesting example of a value chain where sectoral specificities in part determine which of the policy issues discussed above are most salient. From a GVC perspective, a country like Chile provides useful insights. Chile has historically been highly dependent on copper exports, with trade performance closely linked to the price of that one commodity. While there has been some success in functional upgrading, Chile is still developing broader mining-linked goods and services industries (OECD, 2015). Leveraging the services parts of the value chain is in fact an important part of Chile's future development prospects: whereas most minerals producers have around 20% of export value added accounted for by services, the figure in Chile is only 15%, which suggests that further work is necessary to develop service sector linkages.

Another aspect of industrial policy that is particularly important for the mining sector is innovation: OECD (2015) highlights that as a key constraint on Chile's ability to move up the value chain. Creating an environment that fosters innovation in activities related to mining is one way of moving up to higher value added activities, in the way that Canada has diversified its energy sector to include exports of expert engineering services focused on the energy sector, in addition to raw and processed materials.

Backward linkages are therefore particularly important in this sector, and a value chain analysis would bring those aspects out. Offering incentives to foreign investors to make major capacity improvements in mining itself does not guarantee that they will link in a major way with local suppliers. A diagnostic exercise could identify the binding constraints to supplier development in the sector.

Chile is a country that has seen rapid income growth over recent decades, and which is now on target to become a high-income country in the near future. The example of its key mining sector shows how the general aspects of industrial policy discussed above could apply in the admittedly different context of Rwanda, with appropriate reformulation by the government and private sector.

3.10.2 Services Sectors

We can repeat the same analysis for services, using the same methodology applied to the BATIS database, starting with nearly 11 million observations from 2000 to 2012. As noted above, Rwanda does not maintain data on bilateral trade in services, so it is necessary to use modeled estimates in BATIS. The OECD and WTO Secretariats have released this data on an experimental basis to aid research, and they do not represent official estimates. Results should therefore be interpreted with caution, but we believe the interest of identifying services sectors of particular interest justifies the use of these data in this case.

In this case, we index revealed productivity relative to the construction sector. Table 2 shows results for 2007-2012. There is a general pattern of comparative advantage relative to construction, so we focus on the sectors exhibiting the strongest comparative advantage in the last year for which data are available, namely 2012. Based on this analysis, travel (tourism), other business services, insurance services, financial services, and transport all stand out. As with the analysis for goods, each of these

sectors can be analysed using the GVC framework, so the general approaches outlined in the previous sections should be considered in their application to these sectors through the lens of GVC integration.

Table 2: Revealed productivity relative to construction, by ISIC 4-digit sector, Rwanda, 2010-2016, index

Sector	2007	2008	2009	2010	2011	2012
Transportation	1.53	1.30	1.25	1.54	1.39	1.49
Travel	1.75	1.49	1.47	1.88	1.63	1.75
Communications services	0.97	0.86	0.94	1.15	1.17	1.07
Insurance services	1.52	1.37	1.45	1.83	1.36	1.52
Financial services	1.47	1.25	1.36	1.68	1.50	1.48
Computer and information services	1.04	0.85	0.86	1.02	0.95	1.00
Other business services	1.54	1.30	1.32	1.77	1.34	1.63
Personal, cultural and recreational services	1.14	0.91	0.93	1.35	1.07	1.23

Source: Authors' calculations. Note: All indices expressed relative to construction (1.00). Calculated as in Costinot et al. (2012) using balanced export data from OECD-WTO BATIS.

The result for other business services is particularly important, as this aggregate sector contains activities like customer service (call centres) and back office functions. As such, it is a well-known example of a services value chain. Countries like India and the Philippines have leveraged early successes in this sector to develop more knowledge intensive activities, which are associated with higher levels of value added. In this case, the business environment is a key factor from the above discussion that stands out. For lead firms to engage with local service providers, they need to be able to contract in confidence. Similarly, trade policy both in goods and services is a key competitiveness issue. The relevance of trade policy in services is obvious, but goods is less so. The connection is through the use of goods as intermediate inputs into the production of services: providers of business services need to import computer and telecommunications equipment at reasonable prices in order to remain competitive. In this case, the CET allows for duty free imports of computer equipment, which aids competitiveness of final service producers. However, the telecommunications equipment aggregate has an average MFN tariff of 16%, with individual tariff-line duties ranging from zero to 25%. This latter factor tends to undercut the competitiveness of service producers.

The digital economy is a crucial area for development of the business services value chain. Developing firm-level capacity to use cutting-edge technologies both to link with customers and lead firms, and also to develop new business lines, is a key determinant of success in a competitive global marketplace. If Rwanda is to emulate successful examples of development of this services value chain elsewhere, it will need to ensure both that government support for infrastructure development is adequate, and that private sector capacity and human resources are developed in line with industry needs.

3.11 *Macroeconomic Challenges for Industrial Policy: Tax Revenue, Private Savings, and the Current Account*

Industrial policy is only one priority for the government. It is also important to consider social objectives, like improving health and education outcomes, alongside industrial policy when it comes to the broader question of financing growth and development, and managing the current account. Figure 30 highlights a key constraint on Rwanda's growth: its very low savings rate. All countries that have industrialized rapidly have done so on the basis of strong savings. China stands out, but Vietnam and Ethiopia also fit this pattern, with savings to GDP ratios of double Rwanda's. Mauritius has historically had comparable savings rates, but they have declined over recent years.

Figure 28: Gross domestic savings as a percentage of GDP, Rwanda and comparator countries, 2000-2017
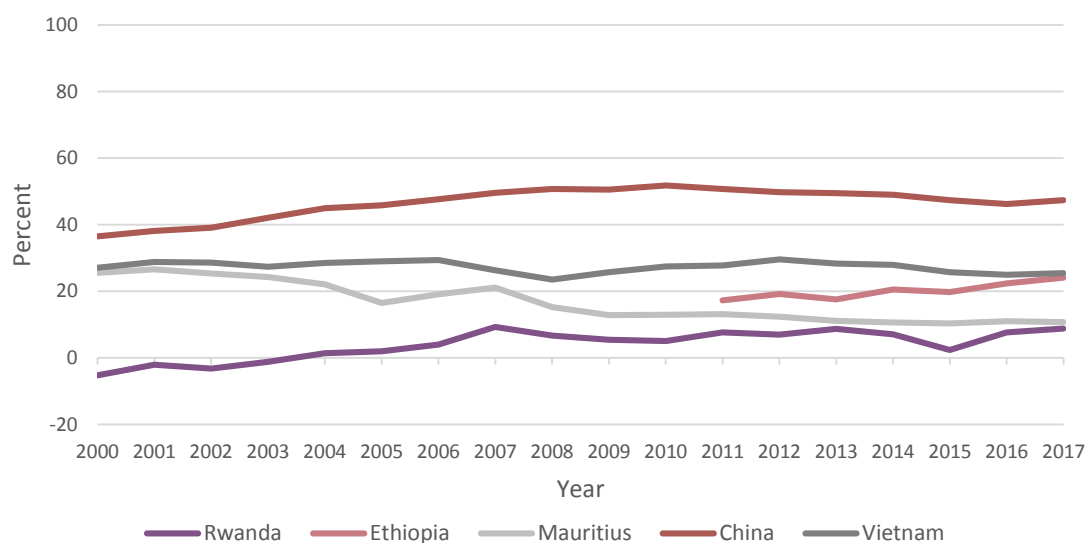
Source: World Development Indicators.

The logic of mobilizing domestic savings to support growth and development is that it essentially shifts consumption forward in time: consumers today sacrifice some current consumption so that future consumption can be higher. In a low-income context, this process obviously needs to be undertaken with great care, as reducing consumption among poor people can have very negative consequences on health and wellbeing. But low-income countries also contain relatively high-income individuals who could reasonably be expected to save both for their own wellbeing, and also to create a pool of resources that can be invested in the economy.

In the Rwandan context, anecdotal evidence suggests that bank deposit rates typically only encourage short term investments, not the kind of long term savings that drive growth. The social security system is one way of making savings compulsory, but ongoing difficulties of formalization mean that it does not touch a large section of the population. The government and the financial sector need to work to incentivize savings by those with sufficient resources.

An additional rationale for incentivizing savings is that in their absence, the economy's growth is largely dependent on foreign investment. In 2017, for example, Rwanda's net FDI inflow was 2.3 times higher than China's as a proportion of GDP, even though China is commonly believed to be a global magnet for FDI.

From a macroeconomic standpoint, a necessary consequence of large net capital inflows is that they must be balanced on the goods side by an excess of imports over exports, or a current account deficit. This conclusion does not follow from any theory of the economy, but simply from the definitions contained in the national accounting system. It is a necessary reality. Management of the exchange rate can smooth the path in the short run, but ultimately the pressure towards a substantial current account deficit is irresistible when the economy is reliant on inflows of foreign capital, rather than domestic savings, to support growth and development.

A key consequence of increasing domestic savings would therefore be to help close the current account deficit. To be clear, a current account deficit is not necessarily a bad thing, but there is concern about sustainability in the Rwandan context, so taking steps to narrow it would be understandable. The most effective step is to increase national savings, which can either be private (the scenario discussed above) or public (moving the government's net fiscal position towards a surplus).

On the fiscal side of the equation, Rwanda's tax base is still relatively limited, at just under 15% of GDP in 2016. While this level is not necessarily unusual in a developing country context, it necessarily constrains the government's ability to finance all of its priorities, from the social sector through to the industrial sector. Taxes on income, profits, and capital are a lower share of revenue than in Vietnam, but are comparable to China; on the other hand, taxes on goods and services are somewhat lower as a proportion of total revenue than in both countries. A related issue is that Rwanda has implemented extensive tax incentives in order to attract foreign investment. While there is a role for such programs, and most countries practice them, one consequence is that government revenue is reduced. There may be scope to rationalize programs, and to concentrate on deductions rather than credits, which still incentivize desired behaviours, but have less upfront cost to the treasury.

4   CONCLUSION AND DISCUSSION QUESTIONS

Rwanda is highly ambitious in terms of its plans for per capita income growth over the medium- to long-term. It needs an industrial policy that provides adequate support to those objectives, in light of the current structure of the world economy. Rwanda's existing industrial policy has provided a body of experience that can be used to inform future actions and priorities.

The key insight of this report is that while Rwanda has been very successful in promoting productivity growth through structural change, within-sector productivity growth has recently slowed down, and this in turn has led to a relative stagnation of aggregate productivity growth. In our view, the number one objective of Rwanda's future industrial policy should be to reverse this trend, and put the country on a balanced path of continued structural change supported by robust within-sector productivity growth. The key mechanism that supports within-sector productivity growth is Schumpeter's "creative destruction", namely the movement of economic resources from low-productivity to high-productivity firms.

A focus on productivity necessarily supports an objective of increased engagement with world markets. Recent industrializers in other regions, even countries with large domestic market, have focused on global export competitiveness as a touchstone of their industrial policy. We believe Rwanda should consider following these examples, and shifting focus from local and regional markets to world markets. Doing so will help firms boost competitiveness by encouraging them to access high quality inputs and capital goods, as well as by realizing economies of scale in production in a way that is impossible through a focus on domestic and regional markets alone.

In light of developments in the world economy over recent decades, the key unit of analysis for Rwanda's industrial policy should be, we argue, the value chain. This lens naturally lends itself to a consideration of linkages among firms, and is consistent with the global pattern of niche specialization and trading in tasks that is the hallmark of the GVC development model. The value chain approach is equally applicable to goods and services, and indeed facilitates the consideration of interactions between them. In terms of models, the development paradigm for Rwanda is less South Korea and more Vietnam, given the fundamental changes that have taken place in world trade due to changing technologies and business practices.

We have identified a range of salient policy issues that are worthy of consideration during the review of the 2011 industrial policy. The list is by no means exhaustive, but we believe we have highlighted some of the major areas where targeted government interventions, in partnership with the private sector, could help support sustained productivity upgrading, which is the only long term way of supporting income growth and development.

Based on the analysis we have conducted, we put forward the following questions for discussion by the government and civil society stakeholders in the context of the review of Rwanda's industrial policy:

1. How can Rwanda's industrial policy, which has enjoyed considerable success, be shifted from a focus on creating production for the domestic market and employment, to a focus on productivity growth in the industrial sector through exports, covering manufacturing and other goods industries, as well as commercial services? Said differently, how can Rwanda's industrial policy outlook be shifted from attaching importance to production for domestic consumption to an outlook committed to competitiveness in the world market?

2. How can concrete policies under the heading of industrial policy be reoriented to focus on participation in value chains? What further studies are needed as a priority to understand the binding constraints on productivity upgrading in key goods and services value chains?

3. In light of the objective of boosting industrial sector productivity, what should Rwanda's negotiating objectives be in the ongoing review of the EAC CET to stimulate its participation in regional and global value chains? How can trade policy in goods be fully integrated into industrial policy, focusing on imports as well as exports?

4. How can Rwanda use trade policy flexibilities outside the CET, such as in trade facilitation for goods and trade in services, to support productivity growth, in particular by facilitating the movement of resources from low productivity to high productivity firms?

5. In light of Rwanda's standing commitment to improving the business environment and investment climate, what are the priorities in key areas like improving access to electricity and facilitating necessary permits and licenses?

6. What options are available to use tax incentives for investors more effectively and efficiently? How can these measures be targeted at marginal firms, thereby reducing the fiscal burden? How can performance requirements be rigorously enforced?

7. How can the government help build a culture of innovation? How can the binding constraints be loosened in key areas like access to finance, technology acquisition and use, and integration into the digital economy? Is there a role for innovation prizes and utility patents in supporting incremental innovations?

8. What opportunities for niche branding are offered by the green economy, and how can government support Rwandan producers in taking advantage of them? How can environmental protection be supported at the same time as industrial development is a priority?

9. How can backward linkages between investors and local suppliers be encouraged? How does value chain analysis support the development of innovative programs to help develop supplier relationships? Can improving the time, cost, and certainty of contract enforcement, as well as programs to reduce information asymmetries, help develop these linkages?

10. What measures are necessary to modulate general policy concerns into specific interventions targeted at high potential value chains in goods and services? What further diagnostic work is necessary to identify binding constraints and develop responsive policies?

11. How can the government put in place structures to ensure that industrial policy is a process of constant learning about what works in terms of interventions, and which sectors genuinely offer the potential for sustained productivity upgrading? From a political economy standpoint, how can the government ensure that industrial policy both deals with market failures, and allows important market mechanisms to work as intended, in particular to shift resources from low-productivity to high-productivity firms?

12. What are the key data requirements for monitoring and evaluating the impacts of industrial policy, to facilitate the learning process described above? How can development partners be mobilized to build statistical capacity where necessary?

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